THE IRON AGE

New York, February 13, 1930

ESTABLISHED 1855 VOL. 125, No. 7

Straight-Line Production of Stoves

Virtual Elimination of Hand Work Between Press Room and Assembly—Circular-Hearth Furnaces for Enameling

BY FAY LEONE FAUROTE*

MY machine shop apprenticeship was served in the Detroit plant of the Olds Motor Works, a long brick structure, the walls of which ran parallel to those of a stove works. From my bench I could look across through the windows into the assembly floor of the stove company. Here in dark rooms, ill lit, black masses took shape and the prosaic business of constructing various kinds of heaters went on. We boys working in an automobile shop, in those days considered quite as romantic as the airplane of today, looked with patronizing pride on the stove business as uninteresting as laying brick.

But progress is the law. No person nor thing can hope to escape it. Prosaic though stove manufacture used to be, it is tied up vitally with our everyday life. It helps to supply food and comfort.

Food and comfort are necessities, but when they were once obtained, what more was necessary? thought our ancestors. Black or drab clothes, colorless, weatherbeaten houses, dull lives! Of what value after the essentials were furbelows, colors and concealments? So reasoned also some of the stove manufacturers. Their business receded accordingly. Finally progress compelled a change. The rising wave of color, the demand for beauty of form as well as substance, made a change of interior decoration imperative. It reached even to the kitchen. Furthermore, due to mass production, prices of other things began to come down and quality to go up. Still the stove business remained stationary except for normal seasonal increases. Then something happened. It had to.

Today, how different! Step into a modern stove factory, the Detroit Vapor Stove Co., Detroit, for example, to learn how all has been changed: color, light, electric furnaces, automatic conveyors, straight-line production, standardized models and attention to niceties of design and harmony of form quite comparable to the motor car.

It was to be expected that such a revolution in stove

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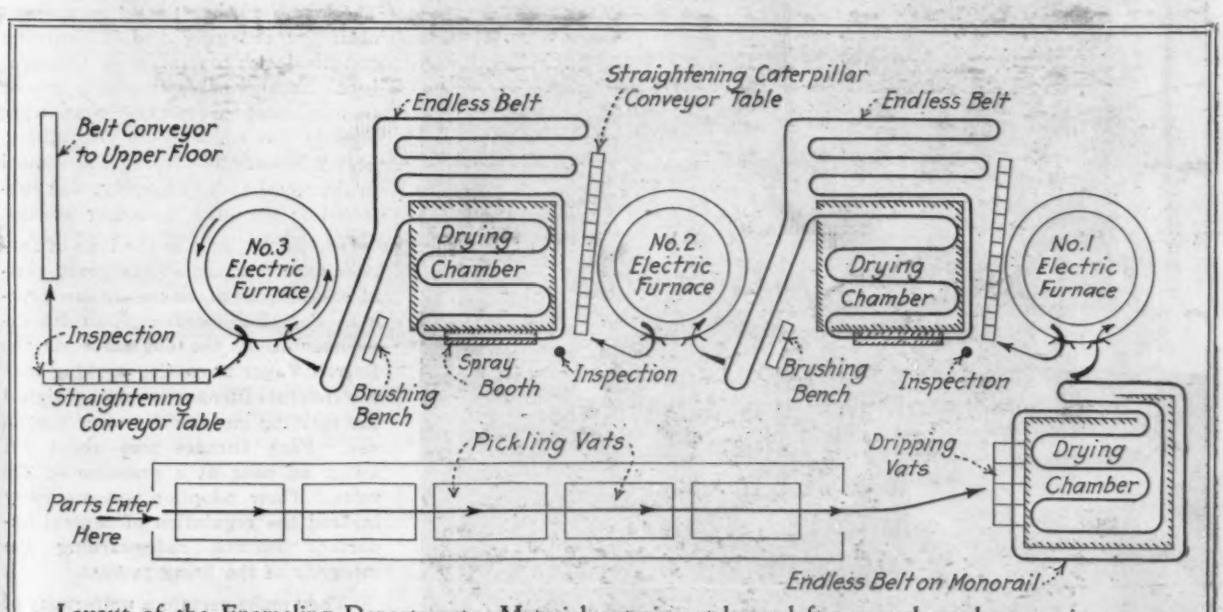
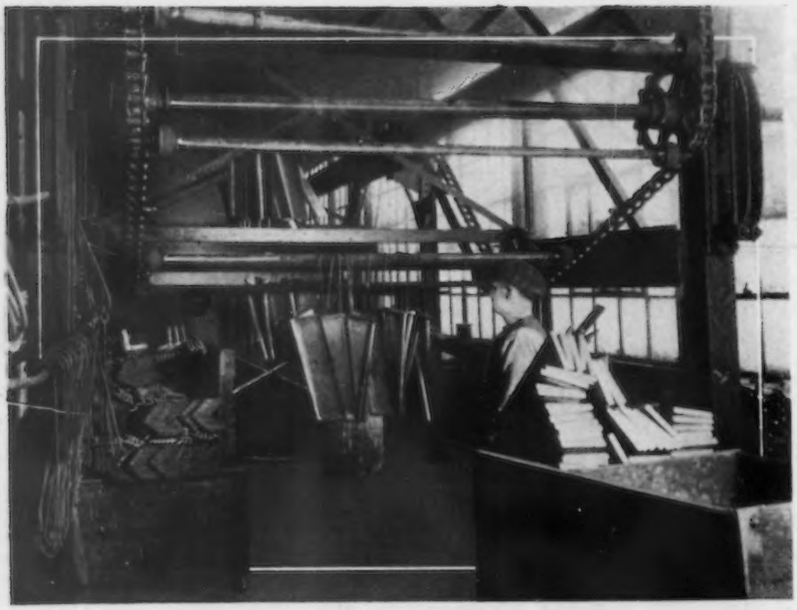


Layout of the Enameling Department. Material entering at lower left passes through successive operations as shown by arrows, leaving at upper left for assembly department



Pickling Conveyor, Which Dips the Parts in the Tanks in Succession and Then Raises Them for the Next Move

manufacture would occur in Detroit, where everyone, even the boys on the street, is familiar with the principles of mass production and straight-line manufacture, which are so widely employed in the manufacture of motor cars there.

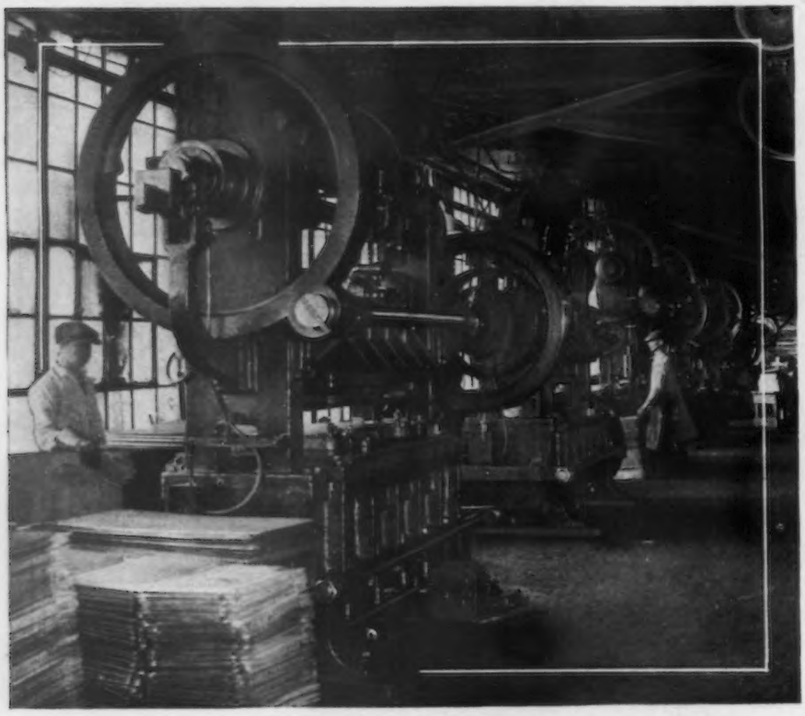
Almost all of the parts of the modern stove—those not cast—are made of sheet steel and enameled. Sections composing a modern gas stove structure are pressed usually from Armco iron; some parts from Monel metal, on account of its non-corrosive character. First operations are of course performed in the usual manner. There is nothing widely different in this fabrication from that of hundreds of other parts made in other shops. There is the usual careful planning of stock to save waste, treatment of stock with a pressing compound before the draw, and the usual allowances for the process, etc. Beyond this point, however, straight-line mass production begins to take hold.

First, it is of interest in the consideration of this process to know that the porcelain-enamel used in coating the sheet metal for stove manufacture is of the quality of true porcelain. It has the hardness, the difficult fusibility, translucency, and whiteness of body which come only when Kaolin, a very pure white clay, is mixed with finely ground felspathic rock. Furthermore, its fusion requires a high temperature and its integrity, a dustless oven.

As early as the fifteenth century it was found that enamel could be applied directly to plates. After one coat had been fused to the surface of the metal, another could be superimposed and fused to the first layer without any danger of separation from each other or from the metal ground. But this process has been still further refined. The metal here chosen for the base is Armco ingot iron, a metal which is slightly porous and is relatively free from alloys which would prevent a proper fusion of the enamel to the base.

It was discovered that the final quality of the surface was dependent also upon the skill with which the firing process was carried on, the length of the burning time, the degrees of temperature, the constancy of temperature, and the fuel used.

At first the ordinary muffle type of furnace was thought to be perfectly satisfactory. But later it was realized that the firing process was largely at the mercy of the operator, who many times was ill fitted by training or experience to perform the operation correctly. The type of furnace, too, affected the result too much. The length of time the door was kept open for charging and discharging disturbed the constancy of temperature. Furthermore, when this type of furnace was used, the parts were brought too suddenly to the intense heat necessary for fusing the enamel to the metal and, conversely, was subjected to too quick a cooling process.



In the Press Department, Which Immediately Precedes Pickling, the Various Sections Are Accurately Formed

Obviously, then, in the type of furnace used was one of the great variables—sources of waste—in the process. So, after months of careful experimentation, the engineers of the Detroit Vapor Stove Co., working with the Holcroft furnace experts, designed the rotating circular furnaces now in use. Each furnace uses about 201 kwhr. an hour at a pressure of 220 volts. Their adoption automatically insured the regulation of several important factors, safeguarding the integrity of the firing process.

They make certain a uniformity of product deemed impossible under the old system. The length of time of firing is controlled not by the operator

but by the speed with which the hearth revolves. The speed is regulated according to the thickness of the metal which is being fired, the heavier sheet steel requiring a longer firing time than the lighter. The temperature can be maintained constant, this being controlled by a rather complex thermostatic arrangement. As the hearth pins are not allowed to cool, the parts can be laid upon them without the damaging and buckling effects that otherwise might occur were it necessary to reheat them each time. Furthermore, skilled furnace tenders are not needed, as the variable factors in firing operations are all controlled by the shop foreman, a man trained in the knowledge of proper enameling practice.

Furthermore, it was discovered that such a type of continuous furnace fits perfectly into a continuous system of conveyor production.

When begun, this straight-line stove production was a piece of pioneer work, but today it has passed its experimental stages and has fully justified its installation. This is how it operates:

It is essential for proper enameling that all pieces be absolutely clean. Hence, with the mechanization of the process, it became necessary to arrange for the passing of the parts as they come from the press room through the several cleaning, acid, neutralizing and rinsing tanks, five in all. The solutions in the pickling tanks are: Oakite, hot-

AT End of Pickling Conveyor (Below) Parts Are Removed and Dipped, Then Hung on the Chain Conveyor (Left, Below) to Pass Through Furnace. In circle is one of the spray booths

water rinse, muriatic acid, soda ash and cyanide, borax. These pickling and washing operations function automatically. The parts are hung on suspended hooks or baskets pendant from long steel rods, 1½ in. in diameter and 7 ft. long, which extend horizontally across between two heavy roller chains, forming a conveyor. Like a similar one in the Ford Motor Co., the entire mechanism, tanks and traveling parts, are inclosed in a well ventilated, fully accessible, glass-sided corridor. The conveyor runs at a constant speed of 140 ft. an hour and has ample capacity to take care of present production schedules and more.

The time that each of the parts is immersed in the

washing solution, acid or neutralizing solution is gaged by the horizontal distance it travels through the tank. When the part reaches the end of the corridor, it has been washed all over, its surface freed from grease spots and acid, thoroughly rinsed and dried. It is ready for its ground coat of blueish enamel.

Taken from the pickling conveyor, it is dipped immediately and set up on a vertical rack, a series of which form the conveying units of an endless belt conveyor of the monorail type. These pressed steel parts then pass, on this conveyor, through a drying chamber, circulating back and forth six times, a distance of about 180 ft. The temperature of the drying chamber is about 125 deg. Fahr.

Emerging, they are given a spray of black edge, and having arrived at the open hearth of the first electric furnace are taken off and laid in a horizontal position upon the vertical pins extending upward on the revolving hearth of the furnace. For enameling metal work such as that used for doors, sides and various other sections of the modern gas stove, three coats are specified, first a ground coat and then two coats of white or colored porcelain enamel. A fusing or burning process is required between each coat and the next. The porcelain-enamel is made up of glass or frit (providing the base), clay, tin oxide, magnesia, a certain composition No. 19, and water. The oxide regulates the color of the enamel.

Withdrawing a Piece from Rotary Furnace. At right of operator is the charging door. The piece is cooled on the conveyor

These unique furnaces are of the electrically heated rotating type, similar to some of the heat-treatment furnaces found in many automobile plants. They consist essentially of a cylindrical steel shell some 25 ft. in diameter, lined with firebrick and provided with two openings at the front of the furnace; one for the introduction of a recently coated part, the other for the removal of the fused unit.

Inside the furnace, supported by a steel framework, is a rotating table of firebrick on whose upper surface are projecting, vertical pins of heat-resisting metal. Upon these the ware is laid for burning. The outside diameter of the hearth measures 175 in. and the inside 113 in. There is a burning area of approximately 14,024 sq. in. The average time required for one revolution of the furnace hearth is 3½ min. for the finishing coats.

Twelve sets of chromel-ribbon elements, placed around the rear half of the furnace directly above the parts to be fused, heat the interior to a temperature of about 1650 deg. Fahr. This temperature is pyrometically controlled.

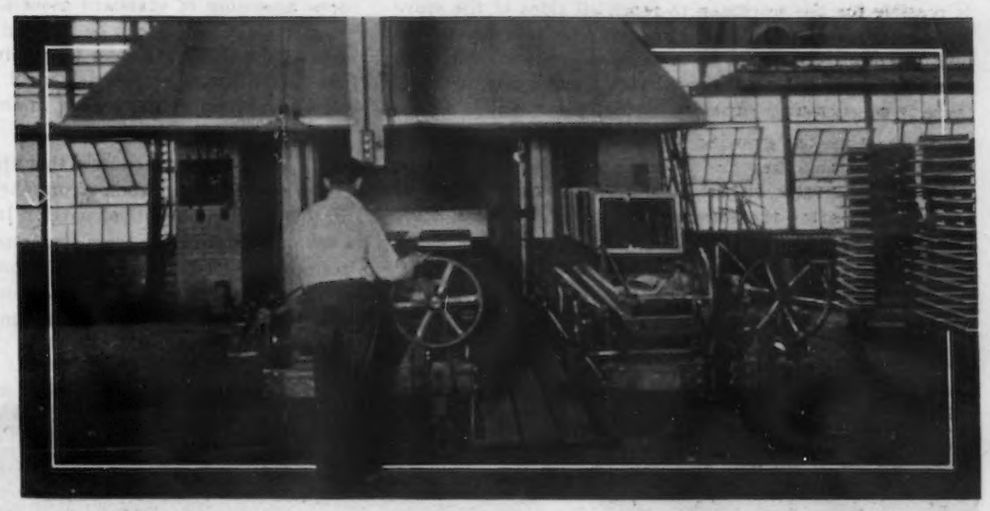
Using electricity for heating, temperature control is simple and accurate. The speed of the rotation of the hearth is also quite capable of easy alteration and control. Such furnaces have proved to be a great improvement over the old type of muffle furnace, even the electrically operated ones.

They have other advantages: cold parts are introduced into a comparatively cool zone. They may be heated to a maximum temperature without distortion or buckling. After passing through the hottest area, where the fusing takes place, they can begin to cool slowly until they reach the exit. Most of the parts are flat. They lie placidly on the tops of the vertical pegs and are heated thoroughly and uniformly. As the hearth is continually rotating, these pins never change materially in temperature. In passing it is interesting to note that such heat as may escape through the mouth of the furnace is collected by a novel form of hood and forced by a blower into the drying chambers alongside, thus conserving much which otherwise might be wasted.

After the fusion of one coat takes place the part is taken out by sliding a long two-pronged fork under the flat piece and placing it on the surface of a corrugated metal caterpillar tractor conveyor table alongside. By the time the piece has reached the end of this moving bench, the top of which is slightly below waist level, it has cooled sufficiently so that it may be picked up by an asbestos-gloved workman at the other end. This man sets it again in one of the pendant vertical racks of a second monorail conveyor. This pursues a back and forth looping course of about 40 ft. and automatically delivers the part to a station where it is again inspected and sprayed.

After passing the spraying booth the conveyor enters a second drying room. Finally, after a brushing, the sheet-metal part is placed in furnace No. 2 and burned at a temperature of 1550 deg. Fahr. Removed from the rotating hearth, put through a duplicate process, given a second coat of porcelain enamel, a third drying journey, a third furnace rotation, a third cooling as before, a final inspection, the part is ultimately delivered to a belt conveyor which transports the finished components to the assembly line racks upstairs.

Of course, for some of the smaller, irregularly shaped parts, small pieces of sheet steel, also burners and grates, this conveyor system of straight-line production is not well suited. To take care of these economically requires that they be handled separately. It has been found to be more efficient to treat them in a straight-line type of muffle furnace, for which, because of its cleanliness and heat control, electricity is used as heat.



MUFFLE-Type Furnace Used for Some of the Work. Adequate ventilation is provided by the hood

By the use of the continuous conveyor system and the electric furnaces the human element has been almost entirely eliminated. It is not necessary to use skilled labor. The parts need little manual handling and hence come through with fewer defects. It is not necessary to rack them between operations. No time is lost, as transportation and burning and transportation and drying are now combined in operation. No storage takes place until after the final inspection. In the case of some parts, the scrap and pieces requiring rewashing or respraying has been reduced as low as 2 per cent. It rarely goes above 15 per cent under any conditions.

Five different sizes of ranges are produced. By possible combinations, however, from these five sized designs there may be assembled stoves with or without heat control, with right or left ovens, etc., so that some 90 different types can be supplied in this way. It is at once apparent that standardization in manufacture and simplification of design, based on actual domestic requirements as revealed by a house-to-house canvass, have made it possible for the engineers of this company to introduce into their stove business a form of mass production fully as efficient as that in vogue in Detroit's automotive plants—and the balance sheets show it.

The plant of the Detroit Vapor Stove Co. is a two-story structure of brick, steel and concrete, about 700 ft. long. The fabrication process just described occupies all of the first floor, with the exception of that devoted to the machine shop, die-room and storage. The entire second story is devoted to the assembly and packing line, with a small corner reserved for a drafting room and offices. A 1000-ft. conveyor track bent so as to run in two parallel sections, with a semi-circular roller table between, takes up the greater part of the second floor. The space between the arms of the U is about 10 ft., and racks and piles of material extend on either side of the section where the assembly begins.

Assembly jigs or benches, upon which the first four progressive operations take place, head the line. Here the main elements of the stove are brought together. Formed on accurate benches, which insure trueness of the base angles, and designed to receive the five sizes, the "chassis" of the stove is here lined up, bolted together and started on its final assembly journey.

As in the final process line at the Ford Motor Co., the needed components are stored in immediate proximity to the conveyor and are added as the assembly passes. The conveyor is of the simple, moving-platform type and it

Sub-Assemblies of Doors and Fronts, Made on Benches, Are Then Passed to the Assembly Conveyor at Right

is possible for the workman to reach all sides of the stove with ease. Each man performs two or three operations and, although the track is capable of accommodating a maximum production of approximately 500 stoves in 9 hr., there is no crowding either of stoves or of men.

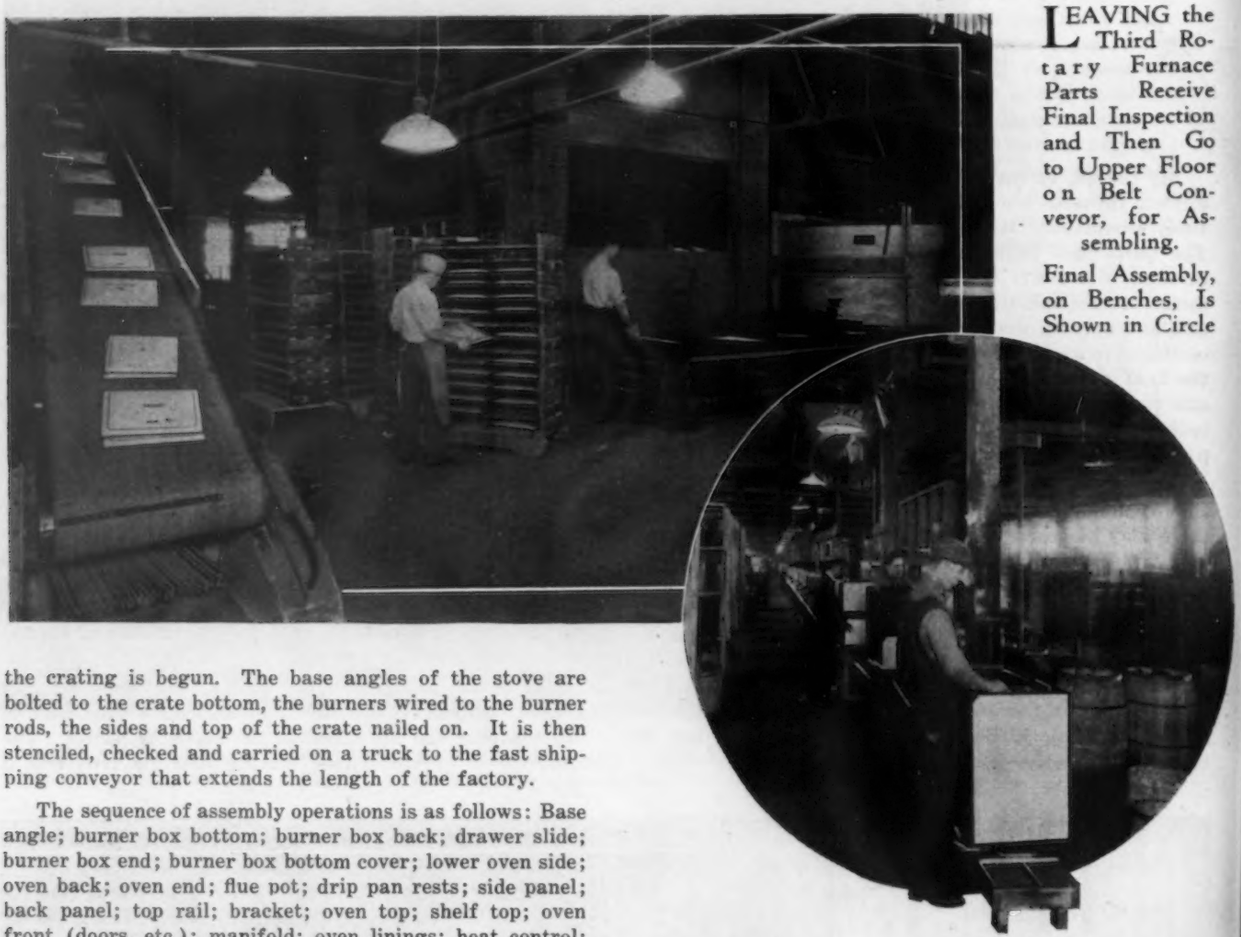
By the time the growing stoves reach the roller crossover on the track, they are complete with the exception of heat controls, grates, burners and oven linings. These are put in later, after the stoves start down the other side. Finally, a hose leading from a gas main is pulled down by a tester, fitted to a quick-connection device, all the burners lighted and the heat controls adjusted.

As soon as the stove is pronounced fit in every detail, the crating is begun. The base angles of the stove are bolted to the crate bottom, the burners wired to the burner rods, the sides and top of the crate nailed on. It is then stenciled, checked and carried on a truck to the fast shipping conveyor that extends the length of the factory.

The sequence of assembly operations is as follows: Base angle; burner box bottom; burner box back; drawer slide; burner box end; burner box bottom cover; lower oven side; oven back; oven end; flue pot; drip pan rests; side panel; back panel; top rail; bracket; oven top; shelf top; oven front (doors, etc.); manifold; oven linings; heat control; burners; testing operations; accessories (drip and broiler pans, grates, etc.); crating.

So flexible is the method of assembly that only about two weeks advanced planning is needed to insure continuous assembly of standard models. Furthermore, special jobs or short orders can be handled adequately in between. A maximum of two days is required from the time any one large order is received, until those stoves are completely fabricated and loaded in the cars, ready for shipment.

It is admitted, of course, that the best results in a porcelain-enamel plant come from the continuous production of 1000 or more identical parts. In the press department a lot of 5000 or more from the same die is economical and desirable, yet so flexible is the process, both of fabrication and assembly, that in this stove company remarkable success has been achieved on sales demands calling for a wide diversity of types, sizes and colors. Production and inventory controls, therefore, do not offer such serious problems as are to be found in many other institutions where variety cannot be so easily controlled.



LEAVING the Third Rotary Furnace Parts Receive Final Inspection and Then Go to Upper Floor on Belt Conveyor, for Assembling. Final Assembly, on Benches, Is Shown in Circle

Inert Materials and Coking Power of Coal

IT has been observed that pieces of mineral matter in coal charged into a coke-oven often appear in the coke in their original shape and can be picked out from the coke without much trouble. This indicates that the coke organic matter is not firmly cemented to the mineral matter. An explanation suggested for this is that the fused matter from the coal, which causes the whole mass to become plastic during the early stages of coking, does not "wet" the minerals as thoroughly as the infusible organic matter of the mass, hence this inert matter in a coal would therefore be expected to have a greater weakening effect on the coke made therefrom than organic inert matter such as mineral charcoal.

Evidence to support this reasoning has been obtained recently at the Pittsburgh Experiment Station of the United States Bureau of Mines. In the course of work on the agglutinating or coking power test on coal, wherein electrode carbon was compared with sand as a diluting agent, it was found that cokes made with sand were weaker than those made with carbon in the ratio 1 to 1.4; particles of the same size were proportioned by weight in each case.

X-Raying Large Steel Castings

First Large Scale Attempt "on the Job"—Minute Examination of High-Pressure Steam Fittings

BY DR. ANCEL ST. JOHN AND HERBERT R. ISENBURGER*

SOME useful applications of X-ray inspection in the industrial field, applications which were carried out in Dr. St. John's laboratory at Long Island City, N. Y., have been discussed in former articles.† It is the purpose of this article to give further information, including some about the X-ray inspection of heavy cast steel pipe fittings for high pressure service, some of which were recently examined "on the job" instead of at the laboratory.

Castings for 1200-Lb. Pressure Steam Plant

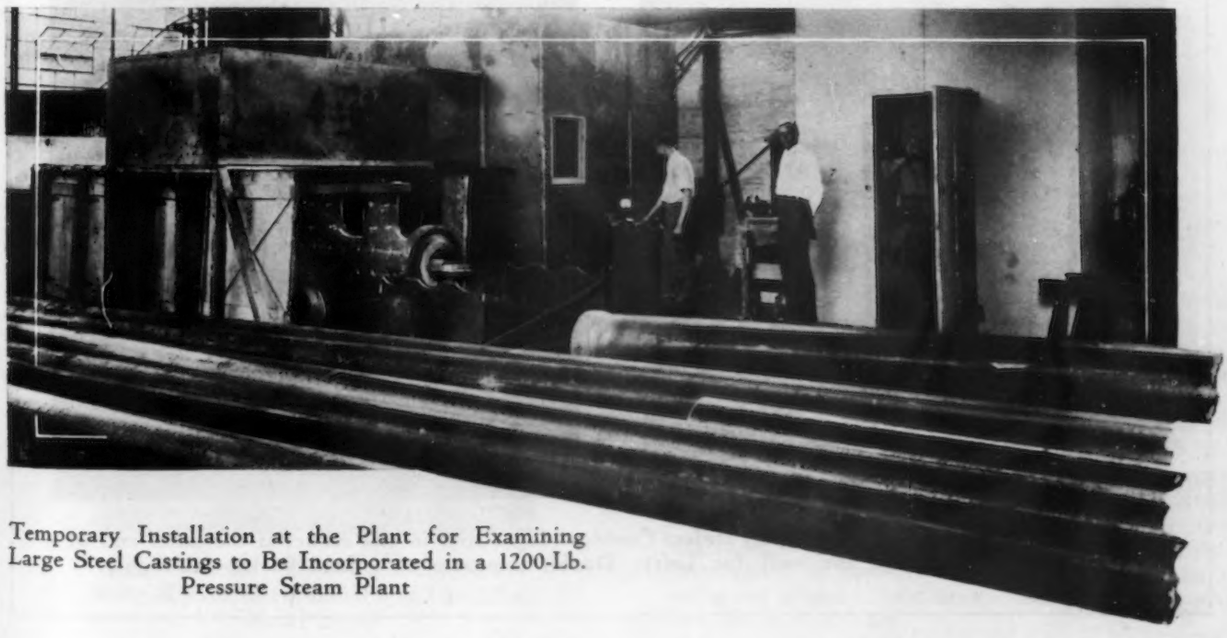
In order to be sure of sound steel castings for a 1200-lb. pressure steam plant, the owners of a new station and their engineers decided to have these castings X-ray inspected before putting them into service. As several of the fittings weighed more than 3 tons each it was decided to carry on the inspection at a place better equipped than the home laboratory for handling such heavy objects. Accordingly, the high potential power plant was transferred to a suitable location near the steam plant. After completion of the inspection, the equipment was returned to the home laboratory. This is the first time in the history of the art that X-ray equipment, powerful enough to examine steel 3-in. thick, has been used as a transportable unit.

One illustration depicts the temporary installation at the plant or "on the job." The X-ray tube is in a lead-lined box within a sheet iron case directly over the casting under investigation. The photographic films are placed in special cassettes on a carrier which can be seen projecting from the end of the casting. The X-rays thus pass through the wall and make a shadow picture which shows the location and nature of any serious defects. During exposure the casting is surrounded by a lead-covered housing to prevent X-rays from going where they are not wanted. The casting and housing travel along tracks under the tube.

How the Current for X-Rays Was Produced

The 200,000-volt direct current is produced by special transformers and rectifiers within a sheet iron room just behind the control stand. The high potential equipment is thus completely surrounded by a grounded metal shield. The high potential power plant, within the sheet metal house, is shown in another illustration. Still another depicts a large manifold mounted for examination of regions indicated by the white stripes, with the lead housing rolled back out of the way, while a further illustration shows the housing in position for an exposure.

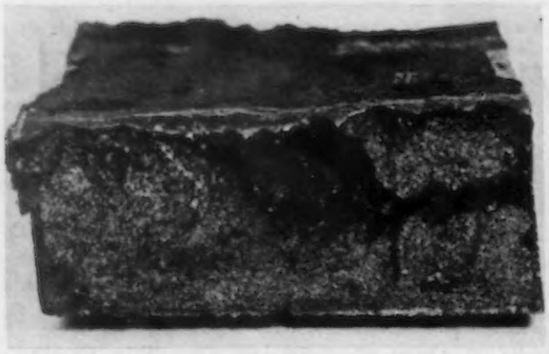
For the complete examination of a fitting of this size approximately 125 X-ray pictures are required, consuming



Temporary Installation at the Plant for Examining Large Steel Castings to Be Incorporated in a 1200-Lb. Pressure Steam Plant

*505 Fifth Avenue, New York.

†Ancel St. John, Ph.D.: "X-Ray Examination of Irregular Metal Objects," *Mining and Metallurgy*, August, 1923; "Steel Castings and X-Rays," THE IRON AGE, Sept. 24, 1925; "X-Ray Inspection of Castings," *Fuels and Furnaces*, September, 1929; by Herbert R. Isenburger: "X-Ray Inspection in the Machine Shop," *Machinery*, May, 1928; "X-Rays and X-Ray Inspection in Piping," *Heating, Piping and Air Conditioning*, June, 1929.



Cross-Section of a Shrinkage Crack in a T Fitting. (Above)

X-Ray Picture of the Shrinkage Crack Shown in Above Illustration. (At Left)

A Clear-Cut "Shepherd's Crack" in a 3-In. Ell Casting. It represents a cold crack starting from a small inclusion, developed by a hydrostatic test which had been passed successfully. (At Right)

about 30 hr. of actual exposure time and at least 10 hr. for arranging the casting and placing the films. The development of films and the loading of cassettes are done while exposures are in progress. Smaller fittings require correspondingly shorter times. For instance, the 6-in. tees averaged about 5 hr. each.

X-Ray Pictures Hard to Reproduce

Very few X-ray pictures of sound steel have been published, probably because they usually show nothing of special interest. An attempted reproduction of one represents such a picture made "on the job." The rectangular dark patch with the number 3.5 is a lead marker identifying the area examined. The parallel bands are screw threads cut on the inner surface. The light spot in the lower right-hand corner is not a defect but is the inner end of a hole drilled through the wall.

X-ray tests, confirmed by sectioning or other collateral analyses, indicate that undesirable internal conditions in castings fall into relatively few classes, all traceable to

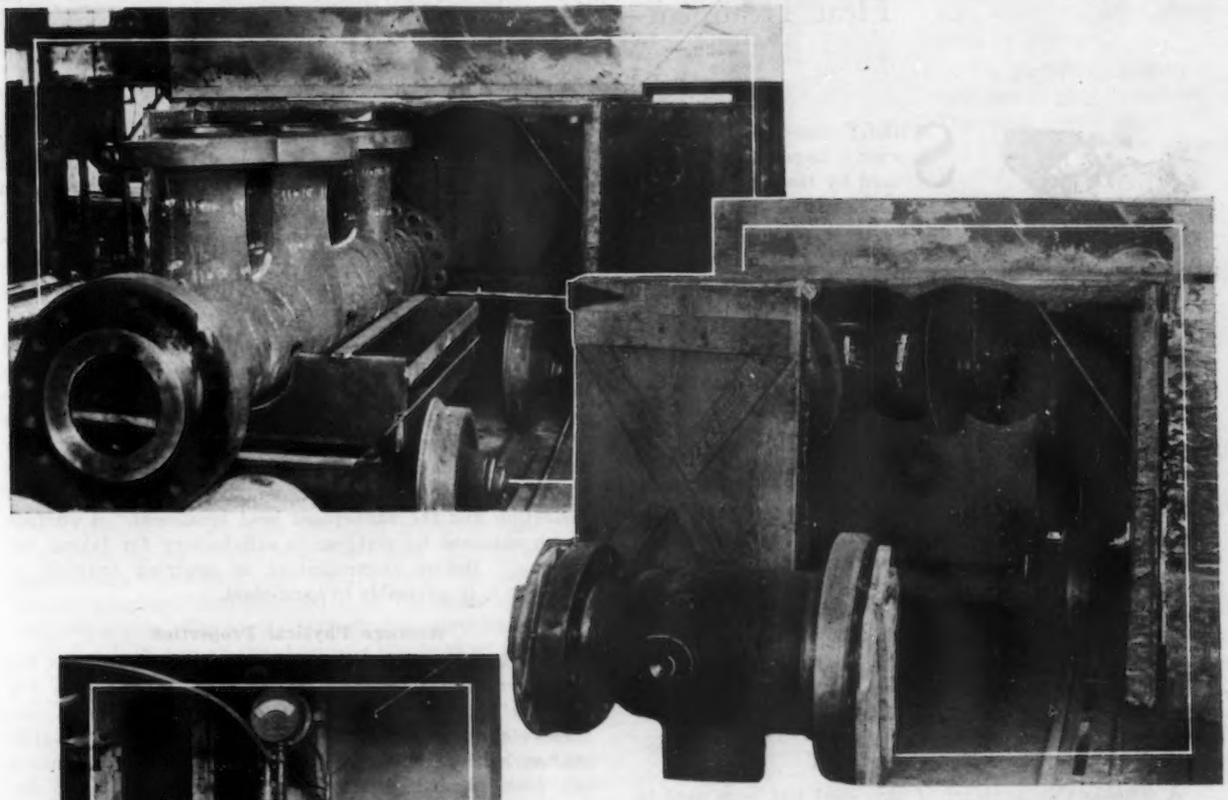
Reproduction of an X-Ray Picture of a Flawless Casting. Light spot in one corner is the inner end of a hole drilled through the wall (at Left); Double Exposure of a Sand Pocket (at Right)

definite and simple causes. Most of these causes, if not all of them, can be eliminated by proper foundry practice. Experience shows that when chronic defects have been corrected by making the indicated changes in casting technique, they tend to stay corrected. It is possible thus to eliminate from 75 to 90 per cent of the major defects.*

*Much valuable information about X-ray inspection is contained in "Recommended Practice for Radiographic Testing of Metal Castings," as E 15-29, published recently by the American Society for Testing Materials. The authors will be glad to supply a copy to any one specially interested.

The principal undesirable conditions are the following:

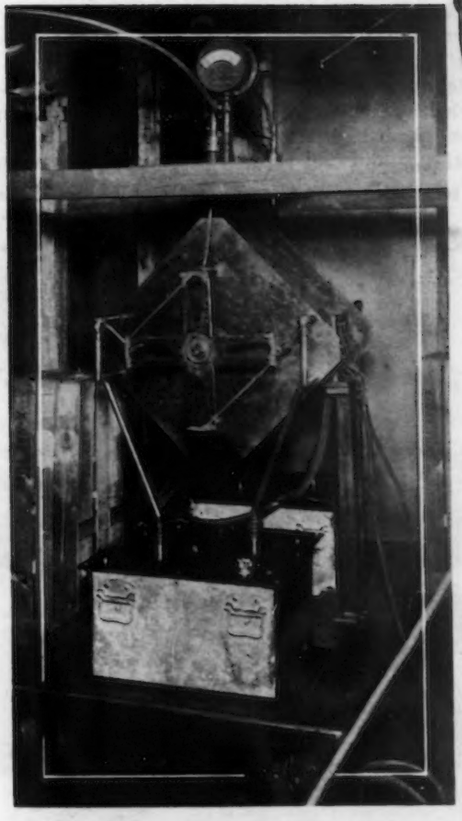
1. Gas, slag and sand pockets due to loose dirt in the mold.
2. Gas cavities due to imperfectly deoxidized metal.
3. Sand inclusions due to cutting of mold or runners.
4. Pipe or primary shrinkage caused by failure of risers to function as intended.
5. Secondary pipes caused by flow of viscous metal through constricted channels in the casting during the final stages of solidification.



LARGE Manifold Steel Casting Mounted for Examination with X-Rays. White stripes indicate regions for examination (Upper Left). Manifold in Position for Examination (Above)

6. Shrinkage cracks starting from a sinus-like cavity developed during cooling.
7. Rupture developed during hydrostatic test.

Some typical pictures, selected chiefly from work at the home laboratory, illustrate some of these.



High Potential Power Plant for Generating X-Rays, Surrounded by a Grounded Metal Shield

Cause of Hardness in Steel

Professor Albert Sauveur of Harvard University has published in *American Philosophic Magazine* (Vol. 66, page 267) a statement of his beliefs on the cause of hardness in quenched steels, which may be summarized as follows: Austenite is a supercooled solid solution of iron carbide or carbon in gamma iron. Troostite is a supersaturated solution of iron carbide in alpha iron. Martensite is an intermediate form where troostite is precipitated along the octahedral planes of the austenite crystals, thus forming a true Widmanstatten structure. Hardness of martensite is due to an inherent property of the Widmanstatten type of structure, to its fineness, and to the hardness of both the alpha and gamma phases. Severe internal strains may also be a contributory cause.

Alloy Steel Sheets for Aircraft

Chrome-Molybdenum Thin Sheets for Heavy Airplanes—How They Are Made—Physical Properties and Heat Treatment—Effects of Welding

BY J. B. JOHNSON*

SHEET steel is one of the very important materials used by the airplane manufacturer. It can be fabricated into practically any form for the main structural members as well as for fittings to join these members together. Sheet steel for structural members must be thin—often less than 0.030 in. in thickness. Its use has been retarded by the lack of suitable methods of joining. The development of mechanical methods of welding by means of the oxy-acetylene flame or electric resistance welding may assist in overcoming this difficulty.

As a material for highly stressed fittings sheet steel is pre-eminent. Plain carbon steel is satisfactory for low-powered, light airplanes, but alloy steel with its high physical properties will show a worth while saving in weight for the larger types. The alloy sheet steel which has been used most generally is a chrome-molybdenum steel conforming to the analysis of the alloy steel tube which has been adopted as standard in the airplane industry.

Three Types Are Used

A considerable quantity of this steel has been used in the cold-rolled condition. The average physical properties for this grade are shown in Table I. It has also been used in the annealed condition where the only physical requirement is a bend of 180 deg. over one thickness. A third type is a hot-rolled or normalized sheet with a tensile strength of 85,000 to 100,000 lb. per sq. in., but with a ductility which varies considerably and, consequently, the fabricating qualities are poor.

In order to meet the need for a sheet steel which can be fabricated into fittings (Figs. 1 and 2) and then welded without serious loss in tensile strength, a special grade of chrome-molybdenum steel has been developed which has several advantages over those grades now in use. The chrome-molybdenum sheet, after welding, should have physical properties equivalent to the tube of the same analysis. The unit strength of chrome-molybdenum tube in the annealed zone at a distance of ⅛ to ½ in. from the seam has a minimum value of 80,000 lb. per sq. in.

A fine-grained annealed sheet of chrome-molybdenum steel with a minimum tensile strength of 90,000 lb. per sq. in. will not lose more than 10 per cent of this strength after welding; therefore, it will meet this minimum requirement. The steel must also have satisfactory fabricating qualities and high resistance to vibration. These properties are determined by the ductility as indicated by the tensile and bend tests.

The chrome-molybdenum sheet steel which has been developed is a hot-rolled product. It is made by rolling 16 to 20-in. ingots into bars about 12 in. wide and from 2 to 4 in. thick. These bars are cut to the length required to roll the size of sheet specified. They are hot-rolled sideways to sheet with a thickness of about 5/16 in. This sheet is then reheated and hot-rolled to the finished dimensions. This final rolling is done with the sheet at an angle of 90 deg. to the previous rolling.

This cross-rolling gives an approximately equi-axed grain and therefore gives equal physical properties both lengthwise and crosswise of the sheet. After the final rolling, the sheet may be heat-treated by a short annealing operation just above the critical temperature, or by a longer box annealing below the critical temperature. The physical properties are dependent both on the amount of reduction and the subsequent heat treatment. A surface finish obtained by pickling is satisfactory for laying out fittings. Before electroplating or applying enamels or lacquers it is advisable to sand-blast.

Average Physical Properties

Average physical properties and chemical analysis for sheets varying from 0.039 to 0.250 in. in thickness are given in Table II. The analysis of the finished sheets conforms closely to the heat analysis. It is designated X-4130 inasmuch as the manganese and chromium requirements are lower and higher, respectively, than specified for S.A.E. 4130.

The tensile strength is sufficiently high to meet the re-

Fig. 1—Sheet Metal Lugs Welded on to Tubular Structures

*Chief, material branch, War Department Air Corps, Dayton, Ohio.

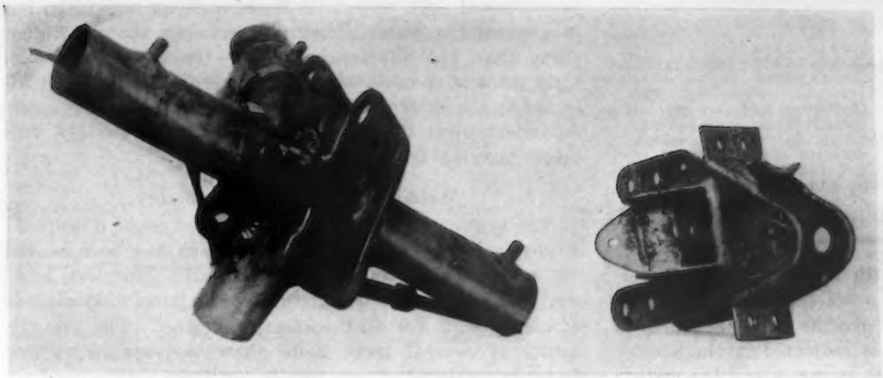


Fig. 2—Typical Welded Fittings

quirements for a large number of fittings and will permit a considerable saving in weight over a carbon steel with a tensile strength of 55,000 lb. per sq. in. The proportional limit was obtained from a stress-strain curve plotted from points taken with an Ewing extensometer graduated to 0.0002 in. The extensometer was attached to the specimen with one point and one disk on opposite sides of the sheet. The load was applied at the rate of 0.05 in. per min. up to the yield point. The yield point was taken by observing the lag of the pointer on a hydraulic testing machine. This material has sufficient plastic flow so that this method gives satisfactory results.

Elongation is a partial measure of the fabricating properties, but it must be combined with the bend test. The quenched and drawn alloy steel with 20 per cent elongation may crack in a bend test, whereas the same steel in the annealed condition and with the same elongation will not crack. The elongation will also vary considerably with the thickness of the sheet and the form of test specimen. A 0.040-in. sheet with an elongation of 12 per cent in the crosswise direction will fabricate as well as a 0.250-in. sheet which has an elongation of 22 per cent.

The relationship between three test specimens is shown in Fig. 3 and Table III. These data were obtained so that it would be possible to interpret specification requirements in the terms of the test specimen which it may be convenient to use.

It is desirable to have one standard form of test specimen and the aircraft industry has generally adopted that shown in Fig. 4-a for thin sheet metals. Since only machines with a large capacity are available in some mills, it may be necessary to use a large specimen with a greater area in order to obtain more accurate readings on the beam. The general relationship between the elongation gage length and area is given by Bertella's equation for the logarithmic curve shown in Fig. 5. The form of this curve is:

$$e = K(L/\sqrt{A})^n$$

where:

e = Percentage of elongation
K = 60 from the curve
n = —0.55 from the curve
L = Gage length
A = Area of cross-section

If the elongation is specified for a certain test specimen, it is comparatively easy to calculate the required elongation on any other form of test specimen by using this equation.

The bend test on sheet steel is a good one for determining the ability of fabricated fittings to resist failure under vibrating stresses. An examination of several fittings of carbon and alloy steel which had failed in service has indicated that the bending properties were poor. The actual bend in the fitting may have been only from 30 to 90 deg. but, due to the low bending qualities of the steel, an overstrained condition was caused by the stretch of the material on the outside of the bend, with the result that small cracks, invisible under ordinary visual inspection, were started and under vibration a rapid failure resulted. A sheet steel which will bend 180 deg. flat over one thickness will not have this overstrained condition in the case of a bend of 90 deg., which is very often made on fittings.

The method of making a bend test is quite important. The bend should be a full 180-deg. bend and is made in the following manner. A 1-in. strip is cut from the sheet and the edges are rounded on an emery wheel or with a file to prevent the formation of edge cracks. The strip is then bent to form an angle of about 60 deg. in a vise or testing machine, and a strip of the same sheet about 1 in. wide is placed on the inside of the bend. The bend is then completed by forcing the two legs of the test specimen flat on the strip, as illustrated in Fig. 6. The strip must show no cracks on the outside of the bend. This test should be made on specimens cut with their axes parallel to both the long and short edges of the sheet.

Microstructure and Heat Treatment

The microstructure shows a fine-grained structure comparatively free from grain distortion due to the hot-rolling. The heat treatment does not remove all traces of the rolling, however, as an etching of the surface of the sheet with a sulphuric acid solution shows the flow lines due to the final rolling. There was no surface decarburization. The changes in structure due to reheat treatment are

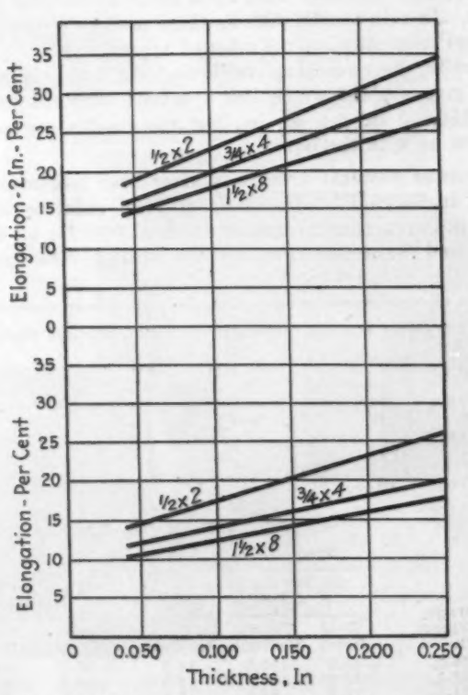


Fig. 3—Effect of Thickness of Sheet on the Percentage of Elongation for Three Types of Test Specimens. The lower graphs show the elongation in 2, 4 and 8 in., respectively, and the upper graph the elongation in 2 in.

Table I.—Physical Properties of Cold-Rolled Sheet

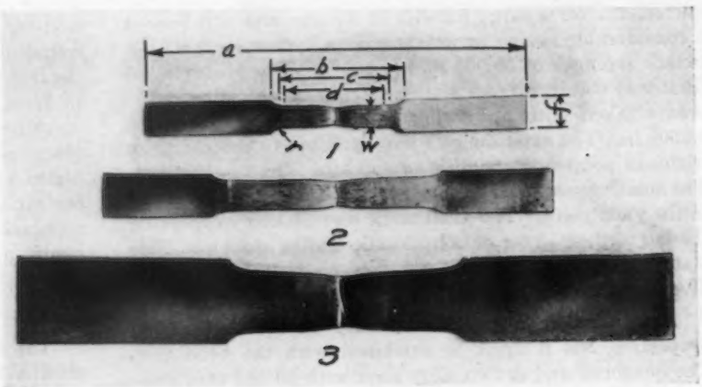
Proportional limit, lb. per sq. in.	40,000 to 50,000
Yield point, lb. per sq. in.	65,000 to 75,000
Tensile strength, lb. per sq. in.	70,000 to 90,000
Elongation in 2 in. per cent	10 to 25, depending upon thickness and amount of reduction on cold-rolling.
Bend	180 deg. flat over one thickness for sheets up to $\frac{1}{8}$ in. and 125 deg. for sheets up to and including $\frac{1}{8}$ in.
After Welding:	
Tensile strength, lb. per sq. in.	65,000 to 85,000

slight and scarcely detectable with the microscope. The microstructures shown in Fig. 7 were taken on sheet before and after annealing to improve the bending properties. A slight grain refinement is indicated in the sheet annealed at 1400 deg. Fahr., which is just above the critical temperature.

Fig. 4—Dimensions of Sheet Steel Test Specimens

Specimen No.	1	2	3
Length, in.—a	8.000	10.000	18.000
Length, in.—b	2.625	4.750	10.000
Length, in.—c	2.250	4.250	9.250
Gage length, in.—d	2.000	4.000	8.000
Width, in.—w	0.500	0.750	1.500
Width, in.—f	0.750	1.000	2.000
Radius, in.—r	0.500	0.500	0.750

Reduced approximately 0.005 in. in width at middle of gage length.



Chrome-molybdenum sheet steel has very satisfactory properties after heat treatment. The quenching temperature varies from 1600 to 1650 deg. Fahr. The steel may be quenched in either oil or water. Oil is preferred where the parts are welded or built up of parts of different thicknesses. In thin sheets, such as those used in aircraft, the physical properties are not affected appreciably by the difference in the quenching mediums. An air quench will often give a sheet which has a tensile strength greater than 150,000 lb. per sq. in., but the results are not so uniform as with the liquid.

Average physical properties after heat treatment are shown in Table IV. The ratio of yield point to tensile strength is practically constant at about 0.92 for all thicknesses and the three drawing temperatures. The ratio of proportional limit to tensile strength is quite erratic, but in general the water-quenched specimens show a higher value than the oil-quenched. The tensile strength and yield point with various drawing temperatures are not affected by the thickness. The elongation, however, is again dependent upon the thickness and increases rapidly with sheets varying from 0.064 to 0.250 in.

Welding Properties Satisfactory

The heat of the welding operation will cause a decrease in physical properties in the zone which has been heated just under the critical and cooled in air. This loss, however, was confined to less than 10 per cent of the original tensile strength for all thicknesses of sheet. The average results of several tests made on welded specimens are shown in Table V. These results are from both plain butt welds and "T" welds. The welds were made with both low-carbon welding wire conforming to the specification of the American Welding Society, No. G-1a, and with chrome-molybdenum steel welding wire of the same analysis as the sheet except for the carbon content, which was 0.15 per cent.

For the unheat-treated welded joints the low-carbon wire is entirely satisfactory and is preferred inasmuch as the weld metal is more ductile than that deposited with chrome-molybdenum rod. In the case of heat treatment where high strength is desired in the weld metal, chrome-molybdenum rod gives good results. In the case of heat-treated welds care must be exercised that there is complete fusion of the weld metal into the corner of the abutting sheets in case of a "T" weld and that the fillet is built up so that the shearing stresses in the weld metal are not

Table II.—Chemical Analysis and Average Physical Properties for Special Chrome-Molybdenum Sheet Steel

Thickness, In.	Lb. per Sq. In. × 1000: Proportional Limit	Yield Point	Tensile Strength	Elongation in 2 In., Per Cent: L	X	Rockwell Hardness: "C"	"B"	Bend, Deg.	Chemical Analysis: Carbon	Manganese	Sulphur	Phosphorus	Chromium	Molybdenum
0.039	55	90	105	14	12	14	99	180	0.33	0.58	0.018	0.017	0.91	0.24
0.062	65	81	100	16	15	16	101	180	0.31	0.58	0.017	0.017	0.92	0.28
0.124	55	76	98	19	17	17	101	180	0.30	0.58	0.015	0.015	0.96	0.25
0.250	45	61	92	26	23	8	94	180	0.31	0.59	0.016	0.018	0.98	0.21

Table III—Effect of Shape of Specimen on Tensile Properties

Average Thickness, In.	Specimen ½ × 2 In.: Lb. Per Sq. In. × 1000: Yield Point	Tensile Strength	Elongation, in 2 In., Per Cent	Specimen ¾ × 4 In.: Lb. per Sq. In. × 1000: Yield Point	Tensile Strength	Elongation, Per Cent: 2 In.	4 In.	Specimen 1½ × 8 In.: Lb. per Sq. In. × 1000: Yield Point	Tensile Strength	Elongation, Per Cent: 2 In.	4 In.	8 In.
0.039-L	88.0	102.0	14.0	87.0	106.0	15.5	12.0	95.0	109.0	18.0	14.0	10.5
0.062-L	80.5	100.0	16.0	80.0	99.0	17.5	12.5	81.5	101.0	21.0	16.5	12.0
0.124-L	76.0	98.0	19.5	78.5	99.5	22.0	15.0	72.5	93.0	25.0	18.0	13.0
0.250-L	61.5	94.5	26.5	61.5	94.5	29.5	20.0	60.0	91.0	34.5	23.5	17.5
0.039-X	87.0	99.0	12.0	93.0	107.0	9.0	7.5	89.5	104.0	14.5	11.0	8.5
0.062-X	87.0	102.0	14.5	81.0	101.0	15.0	12.0	79.5	102.0	18.0	15.0	11.5
0.124-X	77.0	102.0	18.5	76.0	98.0	20.0	16.0	79.0	98.0	23.0	15.5	12.0
0.250-X	66.0	100.0	23.0	59.0	92.0	28.0	19.5	60.0	89.5	36.0	25.0	17.5

L—Lengthwise—Axis of specimen parallel to direction of final rolling.
X—Crosswise—Axis of specimen perpendicular to direction of final rolling.

Table IV—Average Physical Properties After Heat Treatment

	Thickness, In.	Quenched in Oil at 1625 Deg. Fahr. D-650	D-900	D-1100	Quenched in Water at 1625 Deg. Fahr. D-650	D-900	D-1100
Proportional limit, lb. per sq. in.	0.039	160,000	140,000	130,000	170,000	130,000	125,000
Yield point, lb. per sq. in.....		192,000	150,000	140,000	199,000	157,000	143,000
Tensile strength, lb. per sq. in.		210,500	166,500	150,000	210,000	168,000	153,000
Elongation in 2 in., per cent...		2.5	5.5	7.0	2.5	5.5	6.5
Rockwell "C" hardness.....		47	37	32	45	36	32
Rockwell "B" hardness.....		120	117	114	120	117	114
Proportional limit, lb. per sq. in.	0.064	165,000	135,000	110,000	160,000	140,000	130,000
Yield point, lb. per sq. in.....		194,000	156,500	134,500	195,000	157,500	138,000
Tensile strength, lb. per sq. in.		215,000	168,000	146,500	212,000	168,000	151,000
Elongation in 2 in., per cent...		4.5	6.5	9.0	4.0	6.5	8.5
Rockwell "C" hardness.....		44	37	34	46	37	34
Rockwell "B" hardness.....		118	117	114	120	117	114
Proportional limit, lb. per sq. in.	0.124	150,000	130,000	120,000	140,000	125,000	120,000
Yield point, lb. per sq. in.....		206,000	156,000	139,000	191,000	157,000	134,000
Tensile strength, lb. per sq. in.		222,000	169,000	148,000	202,000	170,000	146,000
Elongation in 2 in., per cent...		6.0	8.0	11.0	6.0	7.0	10.0
Rockwell "C" hardness.....		47	40	35	45	39	33
Rockwell "B" hardness.....		122	118	115	120	117	114
Proportional limit, lb. per sq. in.	0.250	140,000	110,000	110,000	170,000	150,000	130,000
Yield point, lb. per sq. in.....		204,000	160,000	141,000	204,000	165,000	141,000
Tensile strength, lb. per sq. in.		222,000	175,000	150,000	229,000	178,000	149,000
Elongation in 2 in., per cent...		9.0	12.0	14.5	9.0	12.5	14.5
Rockwell "C" hardness.....		47	39	35	44	39	34
Rockwell "B" hardness.....		122	118	115	121	117	114

Oil and water about 65 deg. Fahr. Time in furnace, 20 min.
All specimens cut lengthwise. Standard ½ × 2-in. specimen.
Proportional limits taken from stress-strain curves by inspection.

Table V—Average Tests on Welded Specimens

Thickness of Sheet, In.	Tensile Strength, Lb. per Sq. In. Before Welding Average	After Welding Average	Maximum	Minimum
0.250	92,000	91,000	95,000	85,000
0.125	98,000	87,000	97,000	82,000
0.039	105,000	90,000	104,000	82,000

more than 50 per cent of the tensile stresses in the base metal.

A specification for this material should include the following technical requirements:

1. The grain size shall be fine and uniform in all parts of the sheet. The sheet shall not be decarburized to a point that the physical properties are affected. The finished surface shall be free from any scale that would interfere with the laying out of fittings.

2. The sheet shall conform to the following chemical analysis:

Carbon	0.25–0.35
Manganese	0.40–0.60
Phosphorus (max.)	0.040
Sulphur (max.)	0.045
Chromium	0.80–1.10
Molybdenum	0.15–0.25

3. The sheet shall have the following physical properties:

Tensile strength (min.), lb. per sq. in.	90,000
Yield point (min.), lb. per sq. in.	60,000
Elongation in 2 in. (min.), per cent:	
Sheet thicker than $\frac{1}{4}$ in.	20
Sheet $\frac{1}{8}$ to $\frac{1}{4}$ in.	15
Sheet $\frac{1}{16}$ to $\frac{1}{8}$ in.	12
Sheet less than $\frac{1}{16}$ in.	10
Rockwell hardness "B" scale, $\frac{1}{16}$-in. ball (min.)	85

Bend test: The sheet shall withstand bending cold without fracture on the outside of the bent portion to an angle of 180 deg. for sheets less than $\frac{1}{16}$ in., and 135 deg. for sheets thicker than $\frac{1}{16}$ in., over a diameter equal to the thickness of the material.

4. The elongation specified is for a test specimen with a gage length of 2 in. and a width of ½ in.

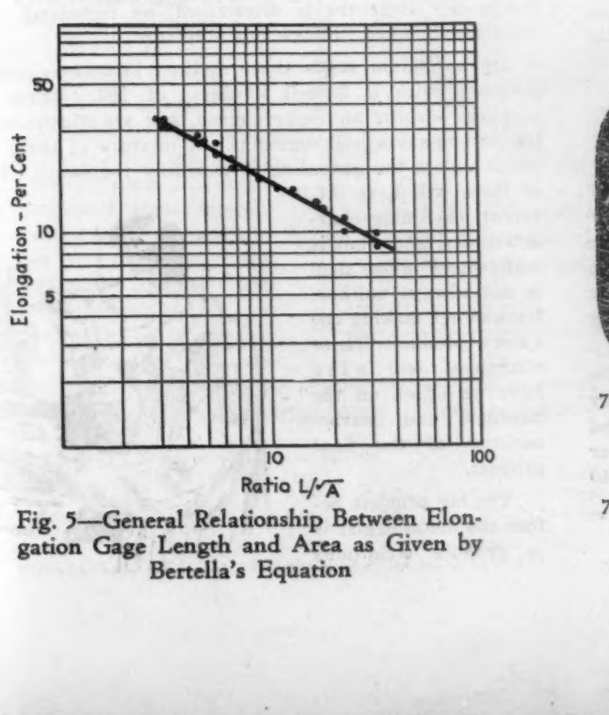
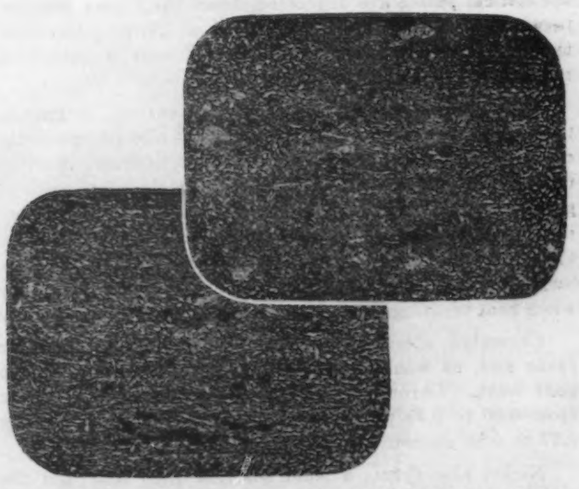


Fig. 5—General Relationship Between Elongation Gage Length and Area as Given by Bertella's Equation

Fig. 6—Typical Bends of Properly Treated Sheet Specimens



7, a, (Left) Sheet 0.093 in. Mag: 500 X. Etch: Nital
Hot-rolled, finishing temperature above critical.

Tensile strength, lb. per sq. in.	118,000
Elongation, per cent	13.5
Bend, 180 deg.	Fail

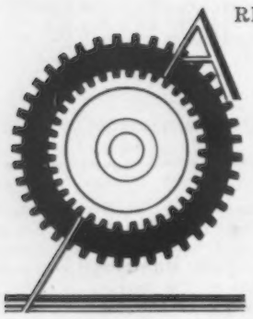
7, b, (Right) Annealed at 1400 deg. Fahr.—5 Min.

Tensile strength, lb. per sq. in.	106,000
Elongation, per cent	14.5
Bend, 180 deg.	Pass

Various Steels Are Used for Gears

Oil-Hardened Gears Are Usually Chromium Steels; Case-Hardened, Nickel Steels—Heat Treatment for Rapid Production on Machine Line

BY N. L. DEUBLE*



REVIEW of gear styles shows that practically all S.A.E. analyses are being used or have been used in the past. When one considers the large number of gear applications, it is not surprising that many types of steel have been used. It would be interesting to know the history back of some of these applications. In some cases certain analyses are adopted because of the success of a competitor with that particular analysis on a similar application. In many instances the metallurgy is well founded and apparent.

This discussion will be limited to small gears such as used in the automotive industry for transmission and differentials. Gear steels can be divided into two classes: (a) the full-hardening and (b) the carburizing grades. The former are usually chromium steels or a modification, while the carburizing grades are nickel steels or a modification.

Effect of the Principal Alloys

Chromium added to iron forms a solid solution, but upon the addition of carbon, complex carbides are formed. Chromium raises the Ar_1 and Ar_3 points. Chromium steels also have the peculiar characteristic that the higher the initial temperature to which the steel is heated, the lower the critical points are depressed, hence the higher the temperature used, the easier the steel is to harden. However, this has its limitations because of the narrow quenching ranges, which produce fine fractures.

Chromium intensifies the action of carbon, increasing the elastic limit and tensile strength. It also increases the depth of penetration and when heavy sections are involved this property is very valuable. These steels are capable of great hardness, and resist abrasion and deformation, but high hardness induces a certain amount of brittleness. Chromium carbide has a slow solution rate, hence prolonged times at heat or high temperatures are necessary when heat treating these steels to insure thorough solution.

Chromium steels have a large economic value in their favor and, as would be expected, are used extensively in gear work. Chromium steels for gears range in carbon from 0.30 to 0.55 per cent, the largest proportion having 0.47 to 0.52 carbon and 0.80 to 1.10 chromium.

Nickel also forms a solid solution with iron and the presence of carbon does not affect this solid solution by forming carbides. Nickel increases the elastic limit and tensile strength as well as resistance to shock. Each per cent of nickel lowers the critical points between 30 and 40 deg. Fahr., which is very advantageous, as it results in low quenching temperatures with less scaling and volume change.

Typical Treatment of Chromium Steel

Gear blanks are forged under supervised control, the temperature being maintained under 2250 deg. Fahr. By regulating the production so that no bar stock is heated over this temperature, overheated forgings are eliminated. Lower initial temperatures result in less scaling and hence a forging with fewer scale pits.

The majority of the gear manufacturers prefer an upset gear blank, because of the uniform grain flow.† Some metallurgists claim that a flat forged gear is 30 per cent weaker transverse to the direction of rolling than in the longitudinal direction. It is also felt that less distortion is encountered in an upset forging. It is a known fact that the machining properties vary more in a flat forged gear than in an upset gear.

No One Microstructure Is "Best"

As a hammer shop cannot maintain a uniform finishing temperature it is necessary to anneal or normalize the forgings prior to machining. With the oil-hardening steel this is absolutely necessary because the blanks are too hard to machine as forged. In preliminary work, various structures should be produced which can be put into the machine shop to determine which one machines the most satisfactorily. This is one place where proper metallurgy is often offset by shop practice. Gears must be machined satisfactorily and economically and the best structure for final hardening may not be the most easily machined. This is particularly true of the full-hardening grades. After the proper structure is determined, an annealing cycle must be set up to produce this structure.

On chromium steels three distinct structures can be produced with a Brinell hardness of 187. These are pearlitic, sorbitic and spheroidized, and are illustrated in the accompanying micrographs. A mixture of these will result unless the annealing is carefully regulated. Each of these will have different machining characteristics, and what is satisfactory in one shop is not always suitable for another making the same product. These structures will also have an effect on the hardness and characteristics of the final product.

The big problem before the metallurgist is to produce conditions

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†See THE IRON AGE, Dec. 5, 1929, page 1513.

so that a uniform product is always obtained. This is impossible to do in a box type furnace, because the cooling rate varies from the center to outside of a pile of gears. A special annealing furnace can be built and from this a uniform product can be obtained both in regard to structure and hardness.

Machine Line Controls Details of Production

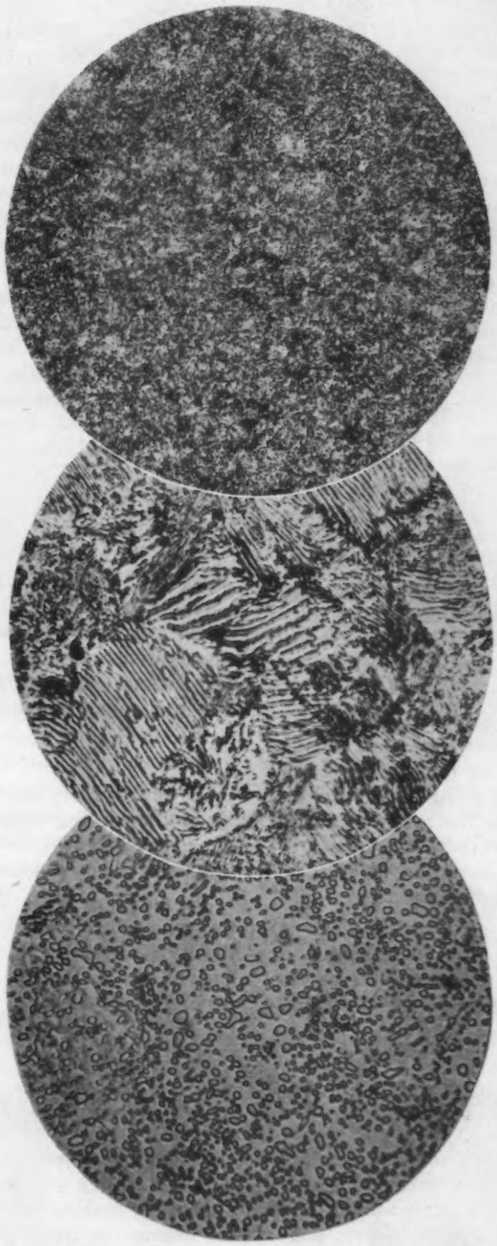
After the proper annealing cycle is set up and maintained, a specific number of gears should be machined to size. These should be checked and marked for proper identification before heat treating. The gears should then be heat treated under very carefully controlled and uniform conditions. The gears should be rechecked for size, using the same procedure as measuring the green gears, and all changes in dimensions should be noted. If the sections are uniform the changes should be regular. This regular change should not be called distortion, because it always exists. If a uniform section changes in dimensions in an irregular manner, this can be termed distortion, and is undoubtedly the result of non-uniform conditions somewhere during previous operations.

If the proper precautions are used to keep conditions uniform the average change on all dimensions can be obtained and allowed for in machining upon a production basis, but in doing this work it is absolutely essential to provide uniform conditions and accurate inspection of dimensional changes.

When heat treating the full-hardening gears considerable scale and decarburization is encountered; these retard quenching and the maximum hardness is not obtained. Salt baths containing 25 per cent or more of cyanide are very suitable to prevent scaling; as long as the cyanide content is in excess of 20 per cent no decarburization occurs. Gears treated in a salt bath are clean and usually have a superficial skin hardness which is very advantageous for resisting wear.

Immediately after hardening, all gears should be drawn. Temperatures between 475 and 700 should be avoided on chromium steels, as gears drawn within this range are more brittle. This brittleness is probably due to the structural changes, the austenite decomposing to martensite.

A uniform drawing temperature will also eliminate certain variables, because steel contracts up to a certain temperature and then expands. This expansion is also due to decomposition of austenite to martensite.



IDEAL Microstructures, Sorbite, Perlite, and Spheroidized Cementite, Respectively. All at 100 diameters, etched with nitric acid

Are Transmission Gears Subject to Shock?

Chromium steel and its modifications, such as chrome-nickel and chrome-vanadium, are used extensively. These full-hardening steels have a fair resistance to wear if designed properly; this wear resistance is further increased by a cyanide bath treatment. For light gears for pleasure cars, straight chromium steel gears are very satisfactory, but they do not have great resistance to impact shocks.

About this point hinges a very heated discussion, that is, "Are gears of this type subjected to impact?" For heavier work such as truck and tractor gears, chromium steels are not suitable. A carburizing grade should be used because of the high tooth pressures, large amount of gear work and the shock stresses in service. By "large amount of gear work" is meant the large percentage of slow speed and second speed to the total mileage. In pleasure cars this factor is low.

Of the full-hardening steels the following are used—S.A.E. 5150, 6150, 3150, 3250 and 2345,* the straight chromium steel 5150 being most extensively used. The chrome-vanadium steels (6150) have a broad quenching range and slightly better resistance to shock. The low chrome-nickel steel 3150 does not show better physical properties than the straight chrome steel, and to increase the depth of hardening and resistance to shock the chromium and nickel must be increased. The 3200 series of nickel steels gives excellent results, but is difficult to

*Approximate analyses are as follows:

	5150	6150	3150	3250	2345
Carbon	0.50	0.50	0.50	0.50	0.45
Manganese	0.65	0.65	0.65	0.45	0.65
Chromium	1.0	1.0	0.60	1.0	...
Nickel	...	...	1.25	1.75	3.5
Vanadium	...	0.15 or more	...	...	...

handle. Some manufacturers are using S.A.E. 2345, which has the highest impact values of the full-hardening steels but no better resistance to wear. The latter two are used for large gears outside of the automotive field.

Advantages of Carburized Gears

Against the school which desires to use the oil-hardening or full-hardening steels, there are those who favor carburized gears. In the carburizing grades the nickel steels predominate. The case-hardened gear has an exceedingly hard surface and relatively soft ductile core. The hard surface of a carburized gear resists wear to a greater extent than the surface of a full-hardened gear, and the core provides good resistance to shock.

Forging and annealing of the carburizing grades should be controlled the same as the full-hardening types. After machining, these gears have to be carburized. The depth and carbon content of the case should be controlled by proper time at temperature and selection of correct carburizing compounds. For most satisfactory control of these factors a continuous furnace should be used, and a mechanical system for cleaning and handling the carburizing compound.

After carburizing, the piece really consists of two different and distinct steels, one with about 0.15 per cent carbon and the other with about 1.00 per cent carbon. These steels have different critical points and quenching velocities. In heat treating a gear of this type more difficulties are naturally encountered than in heat treating a gear which is but one steel. The logical method is to quench for core and case; this necessitates two operations, one high quench for the core and a low quench for the case. In carrying out this procedure considerable difficulty is encountered in maintaining the correct size and shape of the gear teeth.

It has been found that a single quench, somewhere between the two theoretical temperatures, just high enough to put the core in solution (and a time factor as short as possible), gives excellent results. By using a temperature slightly above the critical point for the core, it can be hardened; this temperature of course puts the carbon in the case in solution. By holding a short time at heat, no detrimental grain growth is produced in the case.

By using such a single quench an excellent gear is obtained. The single quench gives good refinement and maximum strength in the core and good hardness in the case. With the double quench the core is hardened and refined but upon reheating to harden the case, the core is tempered so high that its hardness and strength are lost. A well refined core and case is produced but the core is weaker than in a single quenched gear.

Another method is sometimes used, viz: a low single quench. This merely hardens and refines the case. Such a gear would not be suitable for heavy loads, because of its low strength in the core.

Many Steels Used for Carburized Gears

S.A.E. 2315 (3.5 per cent nickel) is used extensively for ring gears and pinions. For increased strength 5 per cent nickel is being adopted in many cases. Besides these two steels there are such modifications as S.A.E. 4215, a 1¾ per cent nickel steel with 0.20 to 0.30 molybdenum, which has a price below the 3½ per cent nickel steel and shows a slightly higher case hardness, but not as great core strength.

The chrome-nickel series of case hardening steels cover quite a large field. The 3100 series (0.60 per cent chromium, 1.25 per cent nickel) are being used for general carburizing work. For greater hardness and penetration the chromium is increased and for greater toughness the nickel is increased. Hence by proper selection of composition almost any desired physical properties can be obtained up to those of the Krupp analysis which has 1¾ per cent chromium and 4 per cent nickel. These high nickel-chromium steels are difficult to machine.

Some plain chromium and chrome-vanadium carburizing steels are also used. These give exceedingly high surface hardness when properly heat treated. There is also a modified chrome-vanadium steel used for gears which responds well to a single quench. This has 0.40 to 0.60 per cent nickel, 0.45 to 0.75 per cent chromium and 0.15 per cent minimum vanadium.

Summary

In review there are two classes of steel used for gears, the full-hardening and the carburizing grades. The chromium steels predominate in the full-hardening class and the nickel steels predominate in the carburizing field.

In handling gears there are certain fundamental factors which must be observed and by recognizing these facts the gear metallurgist can eliminate considerable trouble. One of the most important factors is to maintain uniformity in all operations.

Norwegian Electric Pig Iron Contains Alloys

NORSKALLOY is the name given to a Norwegian brand of electric furnace pig iron produced exclusively from ores containing a quantity of vanadium and titanium, according to the *Iron and Steel Industry*, published in London. The pig iron is available to the following typical analysis in small sand cast pigs:

	Standard, Per Cent	Refined, Per Cent
Total carbon	4.0 to 4.5	2.5 to 3.5
Silicon	0.5 to 1.5	1.70 to 2.5
Manganese	0.20	0.20
Sulphur	Trace	Trace
Phosphorus	0.20 to 0.25	0.15 to 0.20
Vanadium	0.30 to 0.40	0.20 to 0.30
Titanium	0.40 to 0.80	0.30 to 0.50

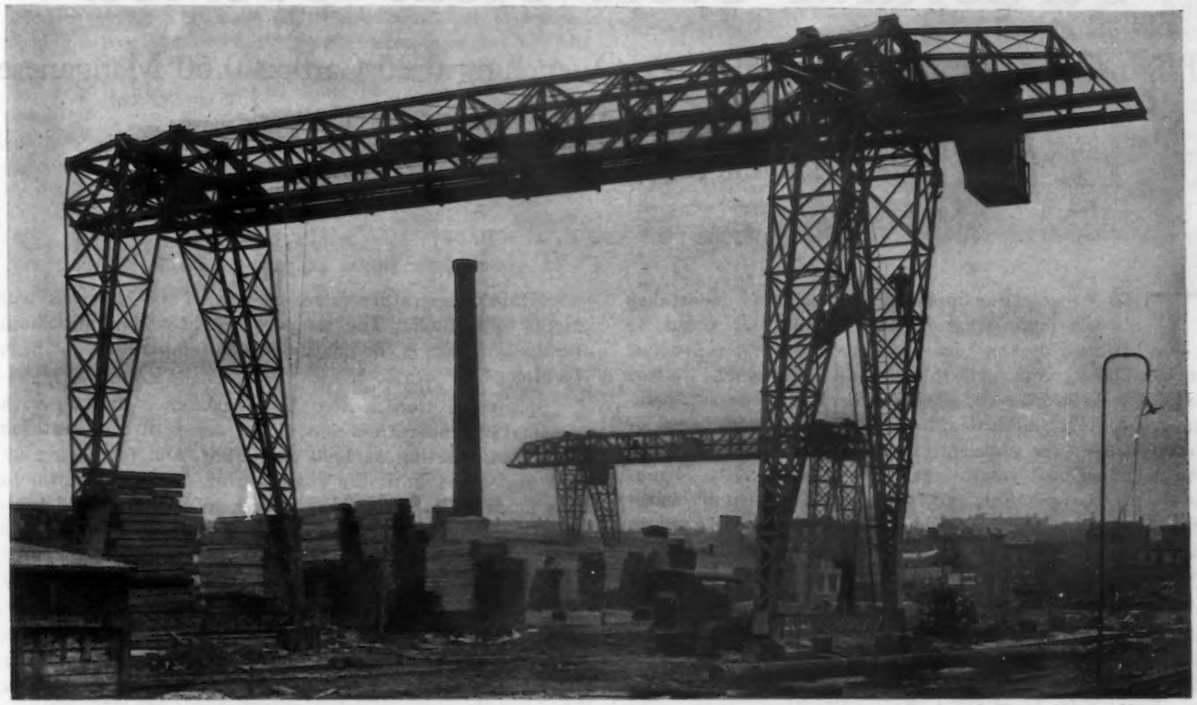
It is of some interest to note that, in addition to the above constituents, investigation has shown traces of other of the rarer elements to be present, such as beryllium, while, if required, nickel and chrome can be added.

In all the studies of the addition of special elements to cast iron, it has long been realized that the addition of vanadium is especially valuable, says the article. The new Norskalloy pig iron offers a cheap and convenient method of making vanadium additions. In remelting in the cupola the titanium has the effect of preventing the loss of vanadium, itself undergoing a slight loss due to oxidation. Norskalloy has a low sulphur content and a phosphorus content sufficiently high to insure the necessary degree of fluidity for foundry purposes. In use, the addition of 15 to 20 per cent of Norskalloy to the mixture is recommended for most purposes where vanadium is required.

In gray iron castings, experimental work has shown that vanadium tends to stabilize the carbide and give improved wear-resisting properties.

In malleable iron castings, the combined effect of vanadium together with titanium remaining after remelting is recommended as of value. The experimental work already in hand in Germany and the United States is claimed to have such beneficial results as to demand serious attention.

Welding Used in Shop Fabrication and Field Erection of Large Gantry Cranes



THESE 7½-ton portal cranes, four of which are being built by the American Crane Co., Friendship, N. Y., for a Brooklyn yard of the Waterfront Service Corporation, are of welded construction. They are 113 ft. overall and 46 ft. from rail to underside of girder. The welding was done with General Electric WD arc welders and the cranes are equipped with General Electric motors and controls. The four portal legs, 56 ft. in height were completely shop welded, as were the two connecting portal frames, 73-ft. main bridge, two cantilevers, two portal girders, four end-trucks, hoist, control cab and the 113-ft. runway. The runway was shop welded in four sections and assembled and welded in the field.

Current will be supplied from a line of 11 self-supporting poles, 52 ft. in height, not erected when the photograph was taken, and two combination poles and floodlight towers, 90 ft. in height. A third 90-ft. floodlight tower will be erected, so that complete light will be available for night operation. All the 52-ft. current-carrying poles are being welded in the shop and shipped ready for erection. The combination poles and floodlight towers are being welded in two units in the shop and assembled and welded in the field.

The welded construction is estimated by the builder to have reduced the total weight of each crane by 20 per cent. As the yard is on filled ground, reduction in the wheel loads of the cranes was desirable.

BEVEL gears in the bridge-driving mechanism are of 0.40 carbon steel. The forged steel rings, diaphragm, plates, hub and radial stiffeners were welded together, after which the teeth were generated. (Left)

FIELD erection bolts of portal girder at truck are welded in after assembly, a more economical practice than removal and filling the holes. The trucks of these cranes are 2-wheeled and totally inclosed. Wheels are of forged 0.40 per cent carbon steel, the web, hubs and stiffeners being welded in, after which tread and flanges were machined. (Right)

Structural Steel Heat Treated

High Elastic Limit Steel Produced by Quenching 0.20 Carbon 0.60 Manganese Steel from 1600 deg. Fahr. and Drawing at 1100 deg.— Welded Joints Respond to Same Treatment

BY P. F. LEE* AND H. A. SCHADE†

THE investigation reported herewith was undertaken to determine what physical properties could be obtained by the heat treatment of a hot rolled low carbon steel, comparable to an S.A.E. 1020 steel. It was desired to determine the effect of the carbon content, manganese content, method of melting, and the thickness of material upon the physical properties to be obtained from the proposed heat treatments. The object was to formulate tentative specifications for the procurement of material suitable for the proposed heat treatments and to secure sufficient information so that the physical properties resulting therefrom could be accurately predicted.

Dr. W. J. Crook of the department of metallurgy and mining, Leland Stanford Junior University, has done considerable work on this subject. Through his courtesy, all of the work previously done by him was made available to us. From a study of the technical literature on the subject, it appears that Dr. Crook is one of the very few metallurgists who have investigated the possibilities of heat treating low carbon steel.

In order to obtain the data desired, it was decided to divide the investigation into two parts. The first series was to be a broad investigation into as large a number of steels in the desired carbon range as could be obtained. From this series it was hoped that the effect of carbon and manganese content, as well as the method of melting, could be determined. It was then planned to obtain a steel whose chemical content and method of melting was satisfactory, and to apply the entire range of useful heat treatments to various thicknesses of this steel. From this second series it was hoped that the remaining desired information could be obtained. A third series to test the weldability of the steel was also planned.

Preliminary Tests on Forty-five Steels

FORTY-FIVE samples of steel were obtained from various sources. All specimens were rolled angles or channels which were cut into pieces at least 18 in. long. All specimens were analyzed for carbon and manganese. Carbons ranged from 0.12 per cent to 0.32 per cent, and manganese from 0.34 to 0.77 per cent.

The initial step was to carry out regeneration tests on all samples obtained to determine whether or not the steel was capable of absorbing all of its free ferrite and retaining it in solid solution when water-quenched. The test consists of quenching a sample of steel in water at a series of temperatures and obtaining its hardness. If the steel is capable of absorbing its free ferrite and retaining it in solid solution, hardness tests will show a regularly increasing hardness for each increase in temperature until a certain temperature is reached when the hardness will begin to fall off. The temperature at which maximum hardness occurs is the proper quench temperature for heat treatment.

Specimens were heated in a resistance furnace with automatic temperature control. A series of temperatures was used, starting at 1300 deg. Fahr. and increasing by 100 deg. steps until the condition of maximum hardness was passed. All specimens were held at the desired temperature for 30 min. The criterion of hardness used was the standard Brinell hardness number. Before each hardness impression was made, a small flat surface was ground on the specimen by a flat emery grinder.

From these tests it was judged that the best average quenching temperature for maximum hardness would be 1600 deg. Fahr. For the steels used, this temperature is approximately the upper end of the critical range.

Test Pieces Given Various Draws After Water-Quench

Heat treatment was done on the tensile test specimens after they had been machined from the original shape. It would undoubtedly have given results more nearly comparable with the results to be expected in actual practice had it been possible to heat treat full size bars, and then cut the tensile specimens from the heat treated bars. Due, however, to the variety of the heat treatments required, and the large number of different samples, this was not practicable. For the purpose of determining the kind of steel adaptable for the heat treatment, and for comparing results at different draw temperatures, it is not believed that the results were adversely affected.

All heating for both quenching and drawing was done in a Hagen resistance furnace, with automatic temperature control. All specimens were held at the quench temperature of 1600 deg. Fahr. for 30 min., and then quenched in cold water in a tank in which the water was constantly agitated by a continuous flow system. All specimens which were drawn were held at the draw temperature for 30 min. and were cooled in the quench bath.

Test bars conformed to the requirements of the American Society for Testing Materials for structural steels, except that the width of the diminished section was 1 in. in place of 1½ in. The specimens were center punched on the flat at 1-in. gage lengths along the entire length of the diminished section, for the purpose of obtaining the percentage elongation in 2, 4, 6 and 8 in. Both the width and the thickness of the diminished sections were obtained with a micrometer. All specimens were pulled to destruction in a 100,000-lb. Olsen vertical beam testing machine. The yield point, or commercial elastic limit, was determined in the usual way by the drop of the beam. It was impossible in many cases, particularly with the specimens which had no draw or a low draw, to obtain the yield point, since if it was present at all, it was of such short duration, even at the slowest pulling speeds, to make the drop of the beam

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The manuscript was approved for publication by the Director of Naval Intelligence.

imperceptible. After fracture, the elongation was measured in 2, 4, 6 and 8 in. with a decimal scale.

Successful Heat Treatment Requires Manganese

In order to determine the value of the regeneration test as a criterion of the suitability of a steel for the proposed heat treatment, the mass of data so obtained was subdivided, using the regeneration hardness as a basis. All steels which failed to regenerate to a hardness of at least 350 Brinell when quenched from 1600 deg. Fahr. were placed in one group, and those which did were placed in a second group. The first group contained 29 steels, and the second 11. Arithmetical averages of all tests are given in Tables I and II. While the arithmetical mean is of interest in showing the behavior of the two groups, in a general way, it should not be considered as conclusive, due to the fact that the various specimens differ considerably, both in chemical composition and in thickness.

A study of the individual results indicated that a regeneration hardness of at least 350 Brinell is necessary before a steel will be greatly improved by the proposed heat treatment. It also appeared that the regeneration test is a satisfactory one for determining the suitability of a steel for the proposed heat treatment.

It will be noted that the average manganese content for Group 1 is 0.46 per cent, while that of Group 2 is 0.66 per cent. The inference is, then, that the higher manganese content is a controlling factor in the proposed heat treatment. We believe that a manganese content of at least 0.60 per cent is essential.

From the data obtained in the first series, it was apparent that factors other than the chemical composition control to a considerable extent the suitability of a low carbon steel for the proposed heat treatment. Some steels having the desired carbon and manganese content failed to regenerate to a hardness of 350 Brinell or to be improved to any great extent by the various heat treatments.

A microscopic study was made to determine if possible the cause of these erratic results. From this study it appears that the method of melting is an important factor; an "open" or incompletely deoxidized steel cannot be greatly improved by even the most drastic heat treatment, regardless of its carbon or manganese content.

It will be noted from the data that the elastic ratio is increased by the heat treatment.

Group I

	Per Cent
As rolled	66.5
900 deg. draw	73.2
1000 deg. draw	74.4
1100 deg. draw	75.0
1200 deg. draw	72.4

Group II

As rolled	69.8
900 deg. draw	63.0
1000 deg. draw	79.0
1100 deg. draw	69.8
1200 deg. draw	78.2

From the above it appears that the increase in the elastic limit of the heat treated steel is proportionately greater than the increase in the ultimate strength.

Detailed Study of Steel of Special Analysis

FROM an analysis of the results obtained in the first series, it was determined that a steel of approximately 0.20 per cent carbon and 0.60 per cent manganese, thoroughly deoxidized, would be the most suitable for further experimentation. Consequently, a steel of this kind was obtained. About forty 18-in. lengths of 2½ x 2½ x ½-in. angle bar, and the same number of 2½ x 2½ x ¼-in. angle bar, were obtained. All of this steel was rolled from the same heat.

A careful analysis was made, in order to insure that no trace of alloy, except manganese, was present. The results of this analysis follow:

	Per Cent
Carbon	0.209
Manganese	0.64
Phosphorus	0.015
Sulphur	0.030
Silicon	0.14
Chromium	0.00
Vanadium	0.00
Tungsten	0.00
Nickel	0.00
Molybdenum	0.00
Titanium	0.00

The entire second series of tests was made using this steel. Two different thicknesses were used in order to determine the variation in physical properties, if any, due to the thickness of the material.

The regeneration test was carried out on two specimens, one from each thickness of the steel. The results of these tests are tabulated below:

Degrees Fahrenheit	¼ In. Specimen	½-In. Specimen
As rolled	131	131
1300 quench	137	143
1400 quench	255	277
1500 quench	388	363
1600 quench	388	388
1700 quench	302	341
1800 quench	285	302

Heat Treatment of Full Section

In this series of tests the full sized bars, 18 in. long, were heat treated, instead of using machined tensile specimens, as was done previously. The results, therefore, are strictly comparable with those that can be expected in actual practice on shapes of similar thickness, the only difference being that in actual practice the bars would be much longer. The heat treatments used are indicated in Table III.

From the results of the preliminary experiments, it was decided that draw temperatures as low as 800 deg. Fahr. gave results which were of little value. Therefore, the lowest draw in this series was 900. Furthermore, it was

INTEREST in higher strength structural steels is manifested by many agencies. The American Institute of Steel Construction has pointed out that standard specification steel can safely carry 10 per cent heavier loads than allowed by most building codes, and is seeking the corresponding revisions.

Bridge engineers have used plain carbon steel eye-bars, heat treated, and medium carbon steel with extra silicon or manganese in the as-rolled condition, where high stresses and low weights are necessary.

British shipbuilders have used a considerable tonnage of heat-treated carbon steel plates and shapes with a true elastic limit twice that of ordinary mild steel.

Lieutenants Lee and Schade here present the first comprehensive figures on what can be done to enhance the physical properties of American structural steels by simple heat treatments.

deemed advisable to attempt a heat treatment consisting of a 1600 deg. quench, with a 1300 deg. draw.

Nine runs were made. Three identical specimens were tested on each run except the last. All bars used for each run were heat treated in the same furnace at the same time. Agreement in individual results was good, as can be seen from the data on runs 5 and 8. Averages only for the other runs are given.

The test specimens for this series were identical with those of the first series, except that the width of the diminished section was 1½ in., so the bars conformed with the dimensions required by the American Society for Testing Materials.

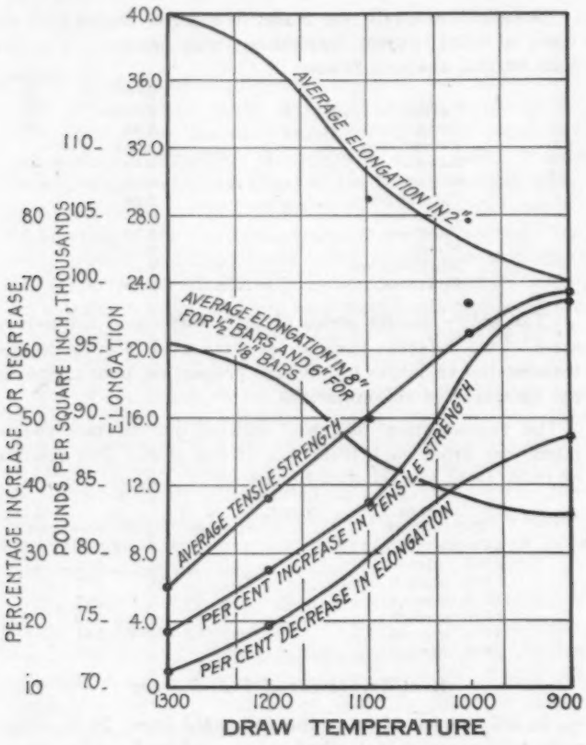


Fig. 1. Summary of Tensile Tests on Heat-treated Structural Steel

One bend test was made for each heat treatment on specimens which were identical in every way with the tensile test specimens.

As in the first series, the elastic ratio was improved by the heat treatment. Below is the elastic ratio of both the ¼-in. and ½-in. specimens for the various draw temperatures:

	¼ Inch	½ Inch
As rolled	69.5	63.2
1100 deg. draw	82.0	77.0
1200 deg. draw	82.5	79.9
1300 deg. draw	76.4	77.9

Effect of Section

From the data obtained, shown in Table III, it is seen that the effect of section is quite decided on the undrawn specimens. When quenched from 1600 deg. Fahr., the ¼-in. specimens gave an average tensile strength of 141,800 lb. per sq. in., whereas the ½-in. specimens gave an average tensile strength of 116,500. This difference is, undoubtedly, due to the more rapid cooling that was possible with the thinner section. Had the ½-in. specimens been heated to a somewhat higher temperature before quenching, it is possible that their tensile strength would have been increased, due to the fact that the rate of cooling would have been greater.

There is no appreciable difference in the tensile strengths of the two sizes when drawn at the various temperatures. There is, however, a difference in the elastic limits. At all draw temperatures the elastic limits of the ¼-in. specimens are greater than those of the ½-in. specimens; no explanation is offered for this variation.

From this data, it is apparent that sections up to at least ½ in. can be successfully heat treated.

Curves of tensile strength and elongation for the various draw temperatures are shown in Fig. 1, together with curves showing the percentage increase in tensile strength and percentage decrease in elongation for the heat treated steels as compared to the steel in its normal condition. From these curves, it is seen that the percentage increase in tensile strength is considerably greater than the percentage decrease in elongation. It is further noted that the heat treatment of hot rolled low carbon steel can be expected to increase the tensile strength by 18 to 65 per cent, depending upon the draw temperatures used. This increase in tensile strength is accompanied by a decrease in elongation of 12 to 47 per cent for the same draw temperature range.

Tests on Weldability of Structural Steel

A SERIES of tests was run on the same 0.21 carbon steel that was used in the second series to determine its weldability, and the effect of heat treatment on the welded joints. All the work was done by men who had qualified as expert welders in a large industrial plant. All welding was by electric arc. Results are summarized in Table IV.

In run No. 1 one bar of each thickness had a bead, approximately ⅝-in. wide for the ¼-in. bar and 1 in. wide for the ½-in. bar, welded transversely across both flanges on the closed angle surface at about the middle of the bar. The bars were then cut into tensile test specimens of the same dimensions as those used in the second series. Each tensile specimen had the welded bead across one flat side about the middle of the diminished section. All specimens broke well away from the welded bead. Welding probably introduces a line of weakness across the specimen, but this is apparently more than compensated for by the increased cross section and additional stiffness added by the bead. In all specimens "necking down" occurred on both sides of the bead; none occurred in the bead.

Run No. 2 was identical with run No. 1 except that all bars were heat treated after the bead was welded and before the tensile specimens were cut out. Both ¼-in. specimens broke well away from the welded bead. Both ½-in.

Table I—Tests on Structural Steels Which Did Not Respond Readily to Heat Treatment

Chemical Analysis	Average	Minimum	Maximum
Carbon	0.19	0.12	0.32
Manganese	0.46	0.34	0.64
Brinell Hardness			
As received	121	99	143
Quenched from 1300 deg. Fahr.	136	...	...
Quenched from 1400 deg. Fahr.	195	...	...
Quenched from 1500 deg. Fahr.	208	...	...
Quenched from 1600 deg. Fahr.	226	...	...
Quenched from 1700 deg. Fahr.	238	...	...
Quenched from 1800 deg. Fahr.	270	...	...

Average Tensile Properties	Ultimate Strength	Yield Point	Elongation in 2 In.	4 In.	6 In.	8 In.
As received	60,400	40,300	41.8	29.8	29.0	25.9
1600 deg. quench, no draw	91,000	.....	21.0	13.3	10.7	9.5
Quenched, drawn at 1200	71,600	52,000	39.8	26.9	22.0	19.7
Quenched, drawn at 1100	73.400	55,300	34.9	23.2	19.3	17.3
Quenched, drawn at 1000	81,800	59,400	32.5	21.4	17.5	15.4
Quenched, drawn at 900	84.200	61,600	28.3	18.2	14.4	12.2
Quenched, drawn at 800	80,600	52,800	26.9	17.1	13.6	11.7

specimens broke under the edge of the bead. We have no good explanation for this difference. Accidental variation in the depth of penetration of the heat of the welding arc might account for it. It seems probable that a line of weakness remains under the bead, but that the increased lateral stiffness in this vicinity tends to prevent "necking down" and thus counteracts this line of weakness. In a larger specimen or full sized plate, the effect of the stiffness due to the welded bead would be proportionately less, since the reduction of area would not be as great at fracture as in the small test specimens, and possibly the line of weakness would be more apparent. When compared to the results of run No. 1, the heat treatment is shown to definitely improve the tensile strength, both of the original steel and of the weld metal. Comparing the results with run No. 5, Table III, it is seen that the tensile strength of the specimen with a welded bead is as high as that of the heat treated unwelded specimen.

Run No. 3 was identical with No. 2 except that the bars were heat treated before the bead was welded and before the tensile specimens were cut out. All specimens broke under the edge of the welded bead, indicating a distinct line of weakness caused by the welding temperature. This was to be expected since the welding temperatures are well above the temperatures used in the heat treatment. However, all beneficial effects of the heat treatment were not destroyed, as is shown by the increase in tensile strength over that of the non-heat treated bars. It is noted that the increase in tensile strength of the ¼-in. bar is proportionately less than that of the ½-in. bar, when these are compared with the specimens not heat treated, probably due to the fact that the penetration of the welding temperatures was proportionately deeper in the ¼-in. specimen.

Heat Treatment Restores Strength of Welded Joint

In run No. 4 one bar of each thickness, not heat treated, was cut in two, transversely, at about the middle of its length. The cut ends were then welded together with a single vee butt weld; the butt ends were then welded on the reverse side.

Run No. 5 was identical with No. 4, except that the bars were heat treated after the welds were made and before the tensile specimens were cut out. All specimens broke well away from the weld. Comparing the tensile strengths with those obtained in run No. 5, Table III, it is seen that the heat treatment after welding, has, apparently, entirely removed all damage done by the welding temperature as well as greatly improved the strength of the weld metal itself. In run No. 4, Table IV, the ½-in. specimens broke *across the weld* at an average tensile strength of 59,900 lb. per sq. in. In this run, using identical specimens welded by the same welder, the specimens broke *outside the weld* at an average tensile strength of 92,100 lb. per sq. in. The weld metal appears, therefore, to have had its tensile strength increased almost 100 per cent by the heat treatment.

The bars used in run No. 6 were identical with those of No. 5, except that they were heat treated before being welded and before the tensile specimens were cut out. The tensile strengths of the welds were higher than those obtained in run No. 4, probably due to accidental differences in the qualities of the welds.

Table II—Tests on Structural Steels Which Responded Readily to Heat Treatment

Chemical Analysis	Average	Minimum	Maximum
Carbon	0.19	0.16	0.23
Manganese	0.66	0.51	0.77
Brinell Hardness			
As received	136	121	146
Quenched from 1300 deg. Fahr.	146	...	...
Quenched from 1400 deg. Fahr.	245	...	...
Quenched from 1500 deg. Fahr.	272	...	...
Quenched from 1600 deg. Fahr.	389	...	...
Quenched from 1700 deg. Fahr.	339	...	...

Average Tensile Properties	Ultimate Strength	Yield Point	Elongation in 2 In.	4 In.	6 In.	8 In.
As received	68,700	47,800	39.7	...	...	25.2
1600 deg. quench, no draw	132,700	.....	9.8	...	...	4.0
Quenched, drawn at 1200	81,600	63,800	31.2	21.2	17.7	15.5
Quenched, drawn at 1100	89,500	62,400	30.2	19.3	15.8	13.7
Quenched, drawn at 1000	103,200	81,400	23.8	15.5	12.4	10.8
Quenched, drawn at 900	105,000	66,400	19.1	10.4	8.0	7.2

Table III—Tests on Structural Shapes Containing 0.21 Carbon and 0.64 Manganese

Run Number	Heat Treatment	¼ In. Specimens: Tensile Strength, Lb. per Sq. In. Ultimate	¼ In. Specimens: Tensile Strength, Lb. per Sq. In. Yield	¼ In. Specimens: Elongation Per Cent in 2 In.	4 In.	6 In.	8 In.	¼ In. Specimens: Brinell Hardness	½ In. Specimens: Tensile Strength, Lb. per Sq. In. Ultimate	½ In. Specimens: Tensile Strength, Lb. per Sq. In. Yield	½ In. Specimens: Elongation Per Cent in 2 In.	4 In.	6 In.	8 In.	½ In. Specimens: Brinell Hardness	Flat Bend Tests
1	Not heat treated															Bend Tests OK
	Av.	64,500	44,900	45.0	34.2	29.9	28.8	123	66,900	42,200	46.7	35.5	31.0	27.4	128	
2	1600 deg. quench, no draw															Both bend specimens broke open on outside surface
	Av.	141,800	.....	9.7	6.0	4.6	3.7	342	116,500	.....	19.0	12.2	9.4	7.7	317	
3	1600 deg. quench, 900 deg. draw															Both bend specimens broke open on outside surface
	Av.	99,300	.....	20.7	13.0	10.2	8.4	206	99,000	.....	28.0	17.3	12.8	10.4	240	
4	1600 deg. quench, 1000 deg. draw															Both bend specimens broke open on outside surface
	Av.	102,000	.....	23.8	15.5	12.3	10.3	204	96,200	.....	31.7	20.2	15.9	12.9	225	
5	1600 deg. quench, 1100 deg. draw	83,800	68,100	26.0	18.5	14.0	11.3	170	91,700	72,800	35.0	22.0	17.0	15.0	212	Both bend specimens cracked on outside surface
		94,000	76,700	24.0	15.5	12.7	11.3	207	87,700	65,800	33.0	19.5	14.0	11.5	207	
		92,400	77,000	26.0	18.5	15.7	13.8	207	91,300	69,700	32.0	20.5	16.7	14.3	207	
	Av.	90,100	73,900	24.7	17.5	14.1	12.1	195	90,200	69,400	33.3	20.7	15.9	13.6	209	
6	1600 deg. quench, 1200 deg. draw															Bend tests OK
	Av.	84,700	74,400	33.7	23.3	18.5	15.6	183	83,100	66,500	41.0	27.3	21.7	18.5	184	
7	1600 deg. quench, 1300 deg. draw															Bend tests OK
	Av.	78,500	60,700	36.3	25.2	20.7	18.0	161	76,200	59,300	44.0	29.0	23.7	20.1	161	
8	Duplicate of Test 5	97,200	86,400	28.0	17.5	14.0	11.8	197	90,000	73,000	33.0	21.0	16.7	14.0	197	
		97,300	86,400	25.0	16.5	13.7	12.8	187	90,000	72,900	37.0	20.5	16.0	13.8	187	
		94,700	84,700	27.0	17.5	13.7	11.3	207	90,600	74,200	36.0	24.0	18.7	16.0	197	
	Av.	96,400	85,800	26.7	17.2	13.8	11.9	197	90,200	73,400	35.3	21.8	27.1	14.6	194	
9	Duplicate of Test 5, except tensile specimen was heat treated	99,400	86,300	26.0	17.5	14.3	12.3	212	95,500	73,800	35.0	22.0	17.0	15.0	207	

The following general conclusions can be drawn from this series of tests on welded pieces:

(a) The proposed heat treatment definitely improves the tensile strength of the metal adjacent to the weld, which was injured by the welding temperature.

(b) The proposed heat treatment definitely improves the strength of the weld metal itself.

(c) Welding after heat treatment destroys in part the beneficial results of the heat treatment.

It appears that the application of a line of welding across a plate of this heat treated steel would introduce weaknesses, the degree of which depends upon the thickness of the plate. This line of weakness would be proportionately greater than that found in ordinary steel plates as rolled. Furthermore, if welded seams or butts were used on plates of this material, it appears that such joints could be made no stronger than though steel not heat treated were used, and would, therefore, have a lower joint efficiency. On the other hand, in those structures which may be heat treated after fabrication and welding, it is apparent that the improved properties of the material could be retained to a large extent in the welded structure.

General Conclusions

THE following conclusions are drawn from this investigation:

(a) Steels containing less than 0.20 per cent carbon, at least 0.60 per cent manganese, and completely deoxidized, will have their tensile strengths definitely improved by suitable heat treatments.

(b) The increase in tensile strength is accomplished by a decrease in the ductility. The percentage increase in tensile strength is greater than the percentage decrease in ductility, as measured by percentage elongation.

(c) The regeneration test is a rapid and accurate method of determining the suitability of a steel for the proposed heat treatment. A regeneration hardness of 350 Brinell, or greater, is considered necessary before any great improvement can be expected from the heat treatment.

(d) Results can be duplicated within reasonable exactness.

(e) The elastic ratio of the steel is increased by the proposed heat treatment. This is considered to be an important point. While high ultimate strength is of great importance, a high elastic limit is of nearly equal importance. Stresses beyond the elastic limit will produce permanent deformation or partial failure of a structure, a result which in certain cases might be equally disastrous to a complete failure.

(f) Welding on this steel after heat treatment must be done with great caution. If the welding can be performed before heat treatment, no injury to the steel will result therefrom.

(g) The heat treatment recommended depends primarily on the physical properties desired in the finished product. For most uses where a steel of high strength coupled with good ductility is desired, a draw temperature of 1100 deg. Fahr. is recommended. This should produce a steel having a tensile strength of about 90,000 lb. per sq. in., an elastic limit of about 70,000 lb. per sq. in., and an elongation in 2 in. of about 30 per cent. Such a steel compares very favorably with the various low alloy steels. In those structures where ductility is of lesser importance, a lower draw temperature should be used. This would result in an increase in the tensile strength and elastic limit. Draw temperatures lower than 900 deg. Fahr. are not recommended due to the great brittleness of the steel when so treated. Draw temperatures higher than 1300 deg. Fahr. add so little to the tensile strength of the original material that their use is not considered justified.

Instead of welding one spot at a time by a heavy current passed between electrodes, "projection" welding utilizes several projections on the work itself (on either one or both of the contacting surfaces). When these are pressed together between flat dies, and a suitable current passed, several spots are welded simultaneously, each one like its neighbor. At the same time there is no indenture on either the top or bottom surface of the work; it is perfectly smooth so that after painting there is no mark where the projection weld was made. This method lends itself very readily to the manufacture of metal furniture, lockers, running boards for automobiles, stiffening strips on automobile cowls, ears on buckets and cans, reinforcing strips on sheets of all kinds. According to a committee of the American Welding Society, one thing that held back the general adoption of projection welding was the fact that there was no material for dies. Now, however, there are two or three proprietary materials that lend themselves quite well to the process; foremost among these is an alloy consisting largely of copper and tungsten.

Table IV—Tests on Weldability of Structural Steel

Run Number	Description of Test Pieces	¼ In. Specimens: Tensile Strength, Lb. per Sq. In. Ultimate	¼ In. Specimens: Tensile Strength, Lb. per Sq. In. Elastic	¼ In. Specimens: Elongation, Per Cent in 2 In.	¼ In. Specimens: Elongation, Per Cent in 6 In.	¼ In. Specimens: Elongation, Per Cent in 8 In.	½ In. Specimens: Tensile Strength, Lb. per Sq. In. Ultimate	½ In. Specimens: Tensile Strength, Lb. per Sq. In. Elastic	½ In. Specimens: Elongation, Per Cent in 2 In.	½ In. Specimens: Elongation, Per Cent in 8 In.	Location of Fractures
1	Bar "as rolled," with welded bead on one side 1 in. wide on ½ in. bar, ⅝ in. wide on ¼ in. bar	70,200 69,200	45,600 46,900	41.0 45.0	25.0 23.0	23.3 23.0	67,200 67,500	41,700 42,500	46.0 41.0	23.3 23.3	All specimens broke well away from the bead, about 2 in., on the average
2	Bead welded (same as Run No. 1). Then quenched from 1600 deg. Fahr. and drawn at 1100	95,900 94,100	....	26.0 30.0	12.0 13.7	10.0 11.8	88,800 91,900	....	20.0 15.0	12.5 10.0	¼-in. pieces broke well away from bead, but ½-in. specimens both broke under edge of bead
3	Bars quenched and drawn from 1100 deg. Fahr., before beads (like Run No. 1) were applied	84,600 81,100	71,800 70,800	14.0 10.0	4.7 3.3	3.5 2.5	90,800 93,300	75,000 75,800	18.0 19.0	8.3 10.0	All specimens broke under edge of bead
4	Bar "as rolled," cut in two transversely, and butt welded, single vee joint	68,000 68,100	46,200 46,300	40.0 43.0	24.7 25.3	22.8 23.5	58,400 61,300	41,700 41,800	2.5 6.0	4.8 6.3	¼-in. specimens broke well away from weld, but ½-in. specimens broke across weld
5	Single vee joint, quenched from 1600 deg. Fahr. and drawn at 1100 after welding	91,300 88,300	....	27.0 30.0	12.7 13.3	11.0 11.3	93,200 91,000	....	38.0 33.0	13.8 12.5	All specimens broke well away from weld
6	Bars quenched and drawn from 1100 deg. Fahr. before welding into single vee joint	77,800 80,000	....	5.0 7.0	1.7 2.9	1.3 1.8	66,700 72,600	....	5.0 7.0	1.3 1.8	All specimens broke across weld before yield point of adjacent metal was reached

Steel Treaters in Winter Meeting

Alloy and Nitrided Steels Discussed at New York—New Manganese-Chromium Structural Steel—Developments in Sheet Normalizing

FOLLOWING a custom established recently to displace regional or sectional meetings with a semi-annual meeting, the American Society for Steel Treating held its third semi-annual, or winter meeting, at the Pennsylvania Hotel, New York, Feb. 7 and 8. The first semi-annual meeting was held in Montreal two years ago. For the first time also, a meeting, together with an exposition, was inaugurated on the Pacific Coast in January, 1929, at Los Angeles. A year from now, or in February, 1931, another Pacific Coast convention and exposition will be held at San Francisco. And it is possible that winter meetings, alternating between the West Coast and the eastern part of the country, may become a regular policy. At the meeting last week in New York a program of eight technical papers was presented, covering a variety of subjects. Alloy steels and sheet steels predominated, with papers on nitriding and other special subjects.

The attendance was not very large, totaling about 200. Preceding the convention there were meetings of the board of directors, the publication committee and the recommended practice committee. One important decision of the board of directors was a radical change in the society's publication policy. Beginning with September, 1930, a new publication will be issued entitled *Metal Progress*, the size of which will be 9¾ x 12½ in. By means of augmented editorial staff the contents of the new magazine is to embrace articles on welding, non-ferrous metallurgy, steel metallurgy and plant descriptions. In addition, there will be abridged publication of papers presented before the national convention. The present monthly issue of *Transactions* will no longer appear, but will be changed to a yearly publication or bound volume, issued in January of each year. This will contain papers in full presented before the preceding national convention in September, including discussions. There will be a charge of $2.50 per volume for this.

Alloy Steels for Forgings and Structures

TWO notable papers on alloy steel constituted the program for the first session, Friday morning, Feb. 7, at which E. C. Bain, chairman of the New York chapter, presided. The greetings of the local chapter were extended to the national society by Mr. Bain and were responded to by R. G. Guthrie, president of the society.

Nickel Steel for Forgings

"NICKEL Alloy Steel Forgings" was the title of an interesting paper by Charles McKnight, in charge of alloy steel development, International Nickel Co., New York. His paper deals briefly with the manufacture, uses, analyses, heat treatment and properties of forgings larger than 4 in. in diameter or equivalent section. Because the information which the paper contains was obtained mostly from manufacturers of forgings, Mr. McKnight stated that its contents are of more benefit to users rather than to makers.

Large forgings constitute an important and constantly increasing outlet for alloy steel. Information available concerning alloy steel forgings is not nearly as complete as that pertaining to other forms of alloy steel, said Mr. McKnight. For example, data published by the Society of Automotive Engineers on the properties, analyses and heat treatment of alloy steel are standard, but are not applicable to large forgings because these are based on tests made on 1-in. bars.

Several classes of alloy steel forgings were discussed by the author besides plain nickel, such as nickel-chromium, nickel-molybdenum, nickel-chromium-molybdenum, nickel-vanadium and nickel-chromium-vanadium steels. All large forgings are or should be heat treated before delivery. A most important part of the author's paper is a table showing the standard specifications for forgings of various sizes, the properties which may reasonably be expected from such forgings, and examples showing properties which actually have been obtained in practice. This is an attempt to correlate the specifications and properties of these materials.

The quality of large forgings has become progressively better for many years, said Mr. McKnight. Today the designing engineer can justifiedly have entire confidence in material of this sort, but through the use of improved steel-making processes, the further use of alloys and the improvement in the mechanical treatment and heat treatment, it is entirely probable that the product of a few years from now will be much better than that of today is, as the product of today is superior to that of 20 years ago.

Formation of heat checks as influenced by nickel and other alloys was brought up, in the discussion, by Robert Job, Milton Hersey Co., Montreal. Mr. McKnight said that lubrication of forged alloy axles is one solution, though a most difficult problem. It may be necessary for American railroads to adopt the forced lubrication system of Europe. Undoubtedly a lower carbon content is better in such steels where there is a tendency toward heat cracks.

It was brought out that molybdenum in such steels reduces temper brittleness, the quantity recommended averaging 0.15 to 0.20 per cent. In England several heat-treating processes are used on nickel-chromium-molybdenum-vanadium steels and it is claimed that temper brittleness is eliminated. Molybdenum does not form carbides up to 0.50 per cent and the British have very little trouble with chrome-nickel-molybdenum and none with nickel-molybdenum steels.

Molybdenum and Machinability

Machinability of such steels was discussed. A. H. D'Arcambal, Pratt & Whitney Co., Hartford, Conn., said that his company was machining chrome-vanadium steel with a Brinell of 250 to 300. Steels made by a Pennsylvania company, containing chromium, nickel and molybdenum and chromium, vanadium and molybdenum, are machinable at 300 Brinell and higher. In fact, molybdenum

must be present to assure good machining qualities. H. J. French, International Nickel Co., New York, declared that structure or grain size is very important in judging machinability, even though machinability is also a function of the tensile strength.

A New Alloy Structural Steel

FOR several years the medium manganese steel, ranging from 1 to 2 per cent manganese, have gained considerable prominence. Some valuable investigations have been made in the research laboratories of the Union Carbide & Carbon Corporation on the effect of chromium additions to these steels. Results of some of this work were presented by A. B. Kinzel in a paper entitled "Data on the Effect of Chromium Additions to Manganese-Chromium Steels," with W. B. Miller of the same laboratories as co-author.

The range of steels studied contains carbon from 0.08 to 0.50 per cent, manganese from 0.60 to 1.80 per cent with chromium additions from 0.30 to 1.10 per cent. The authors show that the effect of the chromium additions is an increase in ultimate tensile strength with proportional decrease in ductility. A practical application of such a steel was demonstrated by the construction of a welded pressure vessel and its subsequent test to destruction with most excellent results. The authors claim that the addition of small percentages of chromium to the medium-manganese steels indicate the possibility of the production of structural steels, as rolled or normalized, having satisfactory ductility and higher strength than the present manganese steels.

Why Chromium Is Added

Excellent results have been secured by one company making tubing from the use of the silicon-manganese-chromium steels, referred to by Mr. Kinzel, said A. V. de Forest, Bridgeport, Conn. But where less rigorous specifications are demanded the manganese-chromium steels have been found eminently satisfactory.

One speaker brought out the fact that one trouble with the medium manganese steels is that, in large sections in particular, this type is sensitive to heat treatment with a tendency to grain growth unless properly controlled, and that the addition of chromium induces fineness of grain. In the case of the manganese-chromium steels, there is less tendency for ingot segregation, said Mr. Kinzel, and this is one reason why they are successful.

Castings of the New Steel

As to castings of this steel, W. C. Hamilton, American Steel Foundries, Chicago, reported that locomotive frames and other castings have been of these manganese-chromium steels. Their composition has averaged: Carbon, 0.35 to 0.40; manganese, 1.45; and chromium, 0.60 to 0.70 per cent. The average physical results have been 110,000 lb. per sq. in. tensile strength, 65,000 lb. per sq. in. yield point, 18 per cent elongation in 2 in. and 24 per cent reduction of area. The casting of this steel has presented no difficult problems. The heat treatment must, however, be exceedingly careful.

De-Nitriding-Steels Possible

A PROCESS for softening the nitrided case of nitralloy steels was described by William J. Merten, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., in his paper, "Annealing or Softening of Nitrided Steels by Chemical Decomposition of the Nitrides." To decompose the nitrides, a fused bath of sodium - potassium chloride is used. With a low temperature for the bath and with a method of heating under gasifying conditions and uniform distribution, serious distortion, warping and scaling are avoided. Steel parts, thus treated, are rendered machinable with ordinary cutting tools, so that changes, alterations and additional machining may be accomplished. Steels, thus de-nitrided, can again be reprocessed without in any manner affecting the case, says the author. Hardness, chemical inertness and other characteristics do not seem to be impaired and service performance has been found equally as good on denitrided parts as on original products.

Congratulating the author on his results, Dr. V. O. Homerberg, Massachusetts Institute of Technology, emphasized the necessity of removing stresses on the materials to be nitrided to insure lack of distortion. He commended the new de-nitriding process as valuable and simple.

Martensite and Its Structure

AN impressive paper on martensite was contributed by E. C. Bain and K. Heindlhofer of the research staff of the United States Steel Corporation, Kearny, N. J., entitled "A Study of the Grain Structure of Martensite."

That martensite is chiefly composed of characteristically distorted ferrite units or grains the size of which is not greatly different from that of the parent austenite is the conclusion of the authors. The hypothesis is submitted that the hardness of martensite is not explained on the basis alone of the grain size or of any distortion of the cold-work type (which is definitely present), but more probably depends upon the strong interatomic bonding within the greatly supersaturated pseudo-solid solution of carbon in ferrite.

Cause and Cure of Stretcher Strains

AN exhaustive discussion of certain phases of manufacture and use of "Sheet Metal and Strip Steel for Automobile Bodies" was presented to the semi-annual meeting of the American Society for Steel Treating in New York, Feb. 8, by Joseph Winlock and G. L. Kelley of the research department, Edward G. Budd Mfg. Co., Philadelphia. The address was confined to basic open-hearth steel sheets, rolled from rimmed ingots, and having the following analysis:

Carbon—0.14 per cent maximum.
Manganese—0.60 per cent maximum.
Phosphorus and Sulphur—0.045 per cent maximum, each.

For excessively heavy draws on light gages the carbon would be less than 0.10 per cent, but in any event the strength and rigidity of the finished part is dependent upon its shape, rather than the chemical composition of the steel.

Steels of this nature are liable to vary, sheet to sheet, and edge to center because they are quite susceptible to differences in grain size due to differences in amount of cold rolling and heat treatment cycles. Variation in amounts of slag or alumina segregation, and amount and location of blow holes also promote this inherent heterogeneity. As long as the temperature is above about 930 deg. Fahr. the plastic deformation in the ferrite grains caused by rolling introduces no internal strains because recrystallization is spontaneous. But a certain amount of cold work is done below that temperature in the hot mills to give the sheet the proper surface, and during this time the grain size is refined and the susceptibility to rapid grain growth on subsequent reheating increases. The lighter and the wider the sheet is, the more chance for non-uniformity, not only in thickness but also in internal strain before annealing and in grain size after annealing.

In the view of the authors, "stretcher strains" or "worms" are inherent to the nature of sheet metal —a thing normally to be expected after a low degree of deformation. They call attention to the fact that sheet steel, being a crystalline aggregate of ferrite, deforms in an elastic manner up to an average load of say 25,000 lb. per sq. in. The crystals change shape slightly with increasing load, but up to the yield point no permanent change occurs. Finally, however, the load becomes such that a certain set of crystals deforms by slip; this causes the first permanent set in those regions, and relieves the stress in others. As the load continues to increase, however, other sets of crystals, less favorably oriented, become overstrained and slip. In other words, at the yield point the elongation at first is confined to certain areas, and later spreads to other regions.

In their experience, stretcher strains in normal sheet steel occur in those regions where the plastic deformation just described is still localized. Regional deformation then

falls between about 1.5 and 10 per cent. The cure is to redesign the dies so that the sheet is stretched either less than 1.5 or more than 10 per cent; for when all the grains in a piece of sheet metal have suffered plastic deformation (undergone crystalline slip) then stretcher strains disappear into a general matte-like roughening of the surface.

Certain shop experiences fortify this conclusion. For instance, a sheet with small average grain size is more liable to stretcher strains than a coarse grained sheet; but it is also true that coarse grained steel has a much less well-defined yield point. Cold-worked steel also is seldom affected with stretcher strains, roller-leveling being done to prevent these defects in the finished stamping; but the stress-strain curve of cold worked metal shows no well defined yield point—plastic strain starts with very low loads. Stretcher strains are more usual in summer than in winter; but the "aging" (recrystallization) of cold worked metal is increased greatly with moderate temperature, and a roller-stretched sheet should be worked within 24 hr. if stretcher strains are to be avoided.

Mr. Winlock emphasized that roller or stretcher levelling should be done in such a manner as to cold work the entire sheet in a uniform manner, else those veinlets where this preliminary work is unusually severe will project as thickened "worms" on subsequent drawing under a press.

In commenting on the scope of Messrs. Winlock and Kelley's paper, E. F. Taylorson, engineer of tests, American Sheet & Tin Plate Co., Pittsburgh, said that their ideas on the cause of stretcher strains were confirmed by studies of plastic deformation with the Fry reagent. A tensile specimen slightly overstrained would exhibit deformed metal in bands near the shoulders; these regions gradually extended toward the center of the test piece as the load increased.

The statement that internal strains in sheets, improperly handled in roller leveling, could be relieved by annealing at 1100 deg. Fahr., brought out clearly the two types of annealing used in sheet manufacture, first, the high temperature anneal to remove the bulk stresses of manufacture, and the low temperature anneal to remove the differential stresses of finishing.

Continuous Furnace for Normalizing

IN a paper entitled "Recent Developments in Normalizing Sheet Steel" E. S. Lawrence, metallurgist Duraloy Co., Pittsburgh, described a five-year development of true normalizing furnaces from the continuous furnaces for blue annealing. The latter had been devised to avoid the time and expense of double box-annealing and to improve the uniformity in physical characteristics of the wide sheets, edge to center. They operated at about 1400 deg. Fahr. (half way between the upper and lower critical temperature) and when the temperature was raised to over 1700 deg. Fahr. for a real normalizing heat, a series of mechanical and metallurgical troubles followed. The water-cooled shafts carrying the conveyor disks or fingers inside the furnace became over-heated in the bearings; the cast iron conveyor parts pitted badly and scratched the sheets; the sheets themselves scaled badly; the water cooled conveyor parts caused a non-uniform heat distribution resulting in non-uniform sheets. To correct these faults, heat resistant alloys were substituted for all iron parts exposed to the high heat; the side walls were sectionalized with proper expansion joints both cross wise and longitudinally at the center-line of shaft bearings, thus preventing binding of the shafts and bulging of the furnace proper; all moving parts were geared together so positive motion could be insured; and the hearth and conveyor rollers were insulated to keep the bottom of the sheets in process at the same temperature as the top.

Solution of these mechanical troubles enabled new furnaces to be built wide enough for 72-in. and even 108-in. sheets. But then certain metallurgical problems arose. It became customary to send sheets through the furnace on "carriers," which were merely waster sheets. But these carriers scaled badly on repeated heating, involving frequent shutdowns to clear the hearth of accumulated slag. A slaggy hearth also prevents proper circulation of heat underneath the carriers, which the furnace tenders would correct by raising the general furnace temperature, which in turn only increased the scaling and pitting troubles. These have been cured by the use of high chromium or chrome-nickel sheets for carriers; they are non-scaling and have a high heat conductivity. However, they are expensive to buy and require considerable labor at the furnace to handle.

Later improvements in furnaces have been in the cooling end. At first the hot sheets were discharged into the air at 1500 to 1800 deg. Fahr., which not only caused excessive scale, but the rapid cooling (air quench) produced a very fine grained sheet too stiff for most purposes. Box annealing was necessary to correct this. The first improvement was to instal temporary covers over the run-out tables; and these were later incorporated as part of the furnace. This reduced the scale somewhat, but it was realized that the best results could be had by a cooling cycle consisting of a fairly rapid and uniform cooling to black heat in a controlled atmosphere. This has been done by separating the soaking region of the furnace from the cooling end by a restricted section, and lengthening the cooling zone so that the time of retarded cooling is considerably extended. This portion of the furnace is constructed with as great care as to its mechanical appurtenances and heat distribution as the regions for heating and soaking.

The cooling cycle on the most advanced types of furnaces, according to Mr. Lawrence, is still too short for full finished automobile sheets, which require a low temperature box anneal for deep drawing purposes. A large fraction of all sheet steel can now be normalized and shipped directly, and he visions the time when normalized sheets will be cooled slowly enough in a continuous furnace to suit *all* present requirements, even though he recognizes the fact that the small grain size produced by normalizing gives an inherently stronger and stiffer sheet than the coarser grain produced by box annealing. As at present developed, the continuous normalizing furnace is producing about 80 per cent of the auto-body sheets, and Mr. Lawrence believes this has enabled the automobile industry to effect many economies in speeding up the press operations, and has furnished them bigger sheets of better surface.

Cost of Continuous Furnaces

In commenting on the cost of continuous furnaces, largely represented by the amount of high alloy heat resisting parts required, E. E. Thum, associate editor THE IRON AGE, New York, said that the box annealing process, being a batch or discontinuous process, was a logical installation for the ordinary sheet mill, which operates on small units in a discontinuous manner. The continuous annealer will find its best application on operations which are essentially continuous, and in fact they have been standard construction for many years past in wire mills, and more recently in the continuous sheet mills and wide and narrow strip mills. Since it seems impossible to convert all sheet mills into continuous mills, it is profitable to consider whether the individual sheets may not be riveted or welded together into a continuous strip, strong enough to take some tension while passing through the furnace. A stretched material of this sort is much easier to handle through a long furnace, and ought to eliminate a large fraction of the expensive conveyor parts now installed to roll the pieces through one or two at a time.

Employees of the E. C. Atkins & Co., Indianapolis, who have been in the service of the company for 20 years or longer, gathered Feb. 1 for the annual banquet of the "Atkins Pioneers' 20-Year Club." Forty-three charter members of the club, which was founded in 1906, were present. Charles F. Aumann held the record for length of service. He joined the Atkins force when he was 12 years old, 60 years ago.

Institute of White Metals Proposed

Organization of an institute of white metals will be proposed at a meeting of white metals smelters and manufacturers to be held at the Astor Hotel on Friday, Feb. 14 at 2 p. m. Representative custom smelters and manufacturers of antimonial lead, Babbitt, solder, type metal and other products of white metals have been invited to attend the meeting by the organization committee, appointed at a preliminary conference of manufacturers on Jan. 21.

The organization committee, which has made a survey of the needs of the industry and has issued the call for the meeting, consists of: I. Davis of Marks Lissberger & Son, Inc., Long Island City, N. Y.; Jerry Katz of the American Metal Co., New York; E. C. Miller of the Magnolia Metal Co. of New York; L. Muscat of the United American Corporation, Brooklyn; J. W. Paterson of the Hudson Smelting & Refining Co., Newark, N. J.; S. Siegel of the Nassau Smelting & Refining Co., New York, and Walter Schoenbach of the American Lead Co., Indianapolis, Ind.

The committee will recommend the need for a trade association in the white metals smelting and manufacturing industry, to eliminate unfair trade practices, conduct an educational campaign in the costs of manufacture, in standardization and in improved trade relations between the manufacturers, their sources of supply and their consumers.

Among the firms that have expressed approval of an association at the preliminary conference or, due to their inability to attend, have offered their cooperation by letter, are the following:

American Lead Co., Indianapolis.; Metals Refining Co., Hammond, Ind.; United American Metal Corporation, Brooklyn; Marks Lissberger & Son, Inc., Long Island City, N. Y.; Belmont Smelting & Refining Works, Inc., Brooklyn; Delevan Smelting & Refining Works, Inc., Brooklyn; Hudson Smelting & Refining Co., Newark, N. J.; Magnolia Metal Co., New York; Columbia Smelting & Refining Works, New York; Federated Metals Corporation, New York; Nassau Smelting & Refining Works, New York; American Metal Co., New York; New England Smelting & Refining Co., Springfield, Mass.; Cambridge Smelting Co., Cambridge, Mass.; H. Kramer & Co., Chicago; The Eagle-Picher Lead Co., Cincinnati; Pittsburgh Smelting & Refining Co., Pittsburgh; Michael Hayman & Co., Inc., Buffalo; Girard Smelting & Refining Co., Philadelphia; Hewitt Metals Corporation, Detroit; Frankel Brothers, Ltd., Toronto, Canada; Michigan Smelting & Refining Co., Detroit; Lowenthal Metals Corporation, Chicago; Sarachan & Rosenthal, Inc., Rochester, N. Y.; Western Smelting & Refining Co., Omaha; Peninsular Smelting & Refining Co., Detroit.

Institute of Metals Spring Program

Technical papers scheduled for the annual spring meeting of the Institute of Metals (British) in London, England, March 12 and 13, are announced as follows:

"Experiments on the Influence of Gases on the Soundness of Copper Ingots," by N. O. Allen.

"Unsoundness in Bronze Casting," by E. J. Daniels.

"Gases in Copper and their Removal," by W. E. Prytherch.

"Protective Value of Some Electro-Deposited Coatings," by L. Davies and L. Wright.

"The Diffusion of Zinc in Copper Crystals," by C. F. Elam.

"Macrostructure of Cast Alloys, Effect of Turbulence Due to Gases," by R. Genders.

"Aluminum-Brasses," by R. Genders.

"Atmospheric Action in Relation to Fatigue in Lead," by Prof. B. P. Haigh and B. Jones.

"Investigation of the Effects of Impurities in Copper. Part VI.—The Effect of Phosphorus in Copper," by D. Hanson, S. L. Archbutt and Grace W. Ford.

"A Note on Metallic Magnesium," by W. R. D. Jones.

"A Note on Zinc-Base Die-Casting Alloys," by R. Lancaster and J. G. Berry.

"The Early Use of the Metals," by T. A. Rickard.

"The Composition of Eutectics," by D. Stockdale.

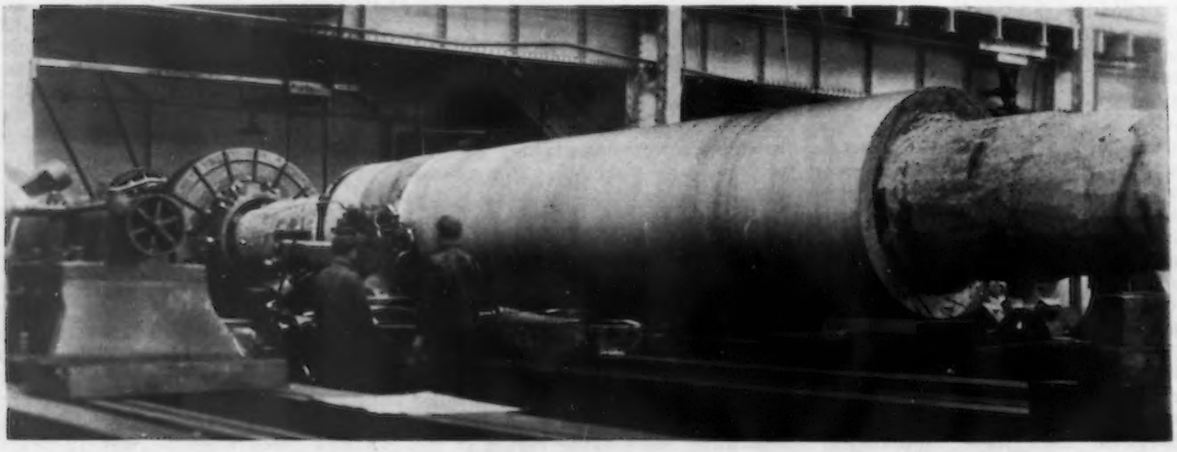
Bulletins Show Diamond Tool Boring Applications

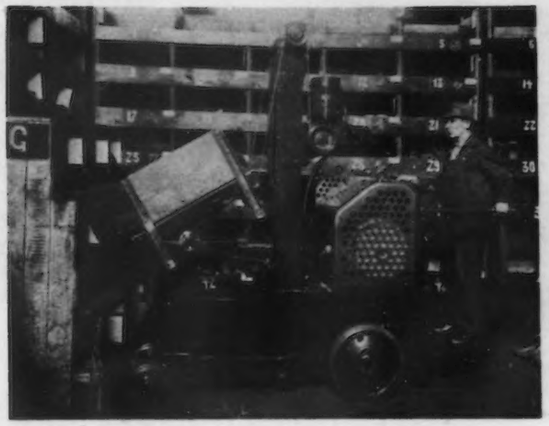
Engineering data bulletins, describing outstanding applications of Coulter automatic diamond tool boring machines, are being issued by the Automatic Machine Co., Bridgeport, Conn.

The data sheets measure 8 x 11 in. and are punched for insertion in the attractive flexible leatheroid binder supplied by the company. Parts covered to date include automobile connecting rods, pistons, airplane engine articulated rods and electric refrigerator parts. Another sheet is devoted to the use and care of diamond tools. In all cases the piece bored, the work-holding fixture, and the Coulter machine used are shown, as well as a line drawing of the fixture illustrating the method of locating and clamping. Essential data, such as material bored, size of bore, machine feeds and speeds, limits, and machining and chucking time are given for each part.

Record Size Forging for Record Size Generator

WHAT is thought to be the largest forging ever made was recently put through the shops of the Midvale Co., Philadelphia, for a 115,000-kw. Allis-Chalmers turbo-generator. Its huge size may be judged better from the photograph than from the statistical facts that it weighs 269,000 lb. and is 42 ft. long. The unit of which it ultimately will form a part will be installed at the Waukegan plant of the Public Service Co. of Northern Illinois. It will operate at 1800 r.p.m., and in rated output will be one of the two largest generators that has ever been built.





SIDE and End-Dump Platforms on Electric Lift Trucks

Side-Dump and End-Dump Electric Lift Trucks

INCREASED flexibility in lift platform electric trucks is provided in two types of trucks added to the line of Elwell-Parker Electric Co., Cleveland. One has an end-dump and the other a side-dump body. In both trucks the table may be tilted 45 deg., and its load may be dumped at any point of elevation in the up-and-down travel. Each truck has a capacity of 2000 lb.

In the end-dump truck the platform is pivoted on the end of two arms at the rear of the carriage. The table is elevated by a cable lift having its operating mechanism under the power unit. The tilting mechanism, mounted on the uprights, consists of a separate motor and a gear reduction to a shaft which carries cable drums on each end. The platform, with its load on a skid, is elevated the desired height and then the tilting mechanism is placed in operation, tilting the platform sufficiently to dump the load from the skid.

The side-dump truck has an equalized cable-shortening device which turns the table to the right or to the left. The elevating travel is accomplished by a hoist placed between the uprights and power unit and carrying the carriage. The lift mechanism is located in front of the operator. The side-dump truck is designed particularly for handling long pieces, but may be used also for handling short sections. The use of the end-dump truck will usually be restricted to short pieces, as narrow aisles will prevent carrying long lengths crosswise.

Both battery and gas-electric trucks may be supplied with these types of dump platform.

Valve Tappet Guides Drilled on Five-Way Machine

FIVE holes are drilled simultaneously in valve tappet guides on the semi-automatic five-way drilling machine illustrated, recently built by the Langelier Mfg. Co., Providence, R. I. The machine is designed to take either of two types of these guides, which are made from brass tubing and measure 1 in. in outside diameter, 4½ in. in length and ⅛ in. in wall thickness.

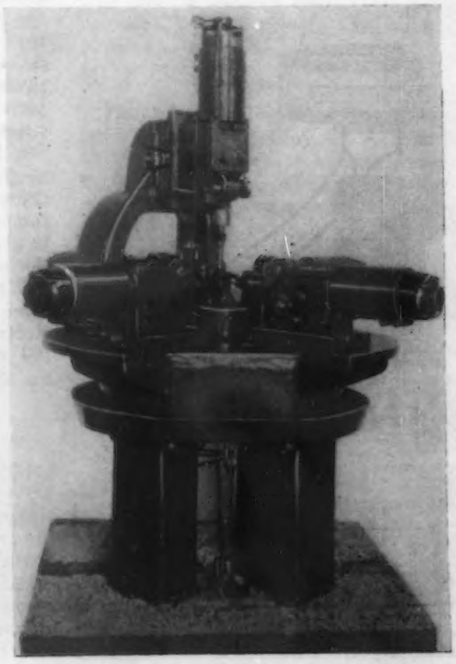
Four of the holes are drilled through the wall of the tube 90 deg. apart, while the fifth hole is drilled parallel to the tube axis 13/16 in. off center. Two of the cross holes opposite each other are 0.159 in. in diameter, and the other two are 7/32 in. in diameter. The diameter of the fifth hole is 0.257 in. The number of pieces drilled approximates 10 per min.

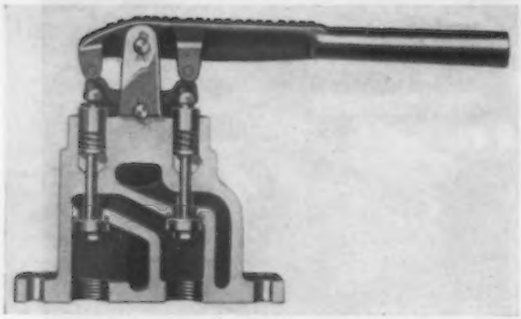
The machine is made up of five Langelier No. 11 automatic drilling heads, four arranged horizontally 90-deg. apart on the circular bed, and one mounted in a vertical position on the upright column, as shown. This vertical head is attached to a double cross-slide, which permits adjusting the drill vertically to working position, and also horizontally to the two different locations required for the two types of valve tappet guides.

Each drilling unit is geared and cammed to give rapid advance of the tool to the work, suitable cutting feed, and then rapid return to complete the cycle. Each unit has a one-cycle clutch, the pawls of which are individually connected to a single foot-pedal control at the front of the machine. The drill heads are individually driven by motors mounted in adapters at the rear end of the drill head. Each of the two types of tappet guides has its drill grinding, holding and locating fixture, both fixtures being interchangeable for location to their correct position in the machine. The fixtures are of Vee locating type, with hinged clamp and hooked hand binding lever.

In operating the machine, the attendant places the piece to be drilled into the holding fixture, clamps it, and then trips all of the drilling unit clutch pawls simultaneously by depressing the foot-lever control. The drilling units then go through their respective cycles and stop automatically, after which the operator removes the completely drilled piece from the fixture.

The machine occupies floor space of 56 in. x 56 in., and weighs approximately 3000 lb.





ROSS Operating Valve for Control of Double-Acting Air Cylinders. All ports are now in the base, the poppet assembly has been redesigned, and hardened steel rockers are now employed

Improved Air Cylinder Operating Valve

THE Ross Operating Valve Co., 6488 Epworth Boulevard, Detroit, has brought out an improved model of its value, two styles of which, for the control of single-acting and double-acting air cylinders, respectively, are manufactured.

Improvements include a new method of poppet assembly, with constant pressure packing, and sturdier springs that are properly protected. Hardened steel rockers are now standard on all sizes. Composition disks of new design are said to assure air tight seats under the most severe conditions, and the elimination of one port on all four-way valves is intended to reduce piping to a minimum.

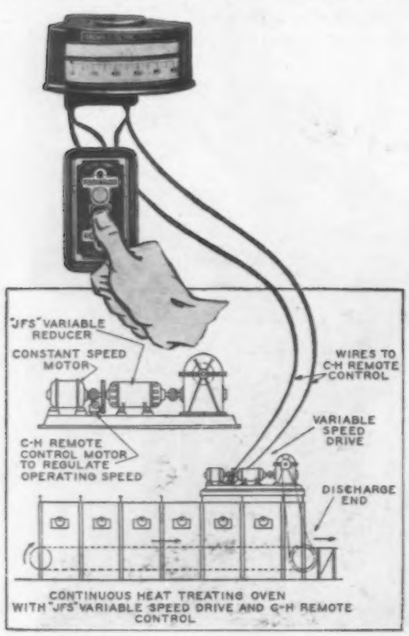
These valves are made in four sizes, from ⅜ to 1 in. They can be furnished either in locking or non-locking types for hand or foot control, and may be adapted for mechanical or electrical installations. Designed upon the poppet principle, with air pressure seating the poppets, these valves are said to assure rapid operation, accurate control, and air tight service over long periods. All ports on both the three-way and the four-way valves are placed in the base of the valve, which makes possible the permanent installation of all piping and the convenient removal of the valve by loosening the bolts which hold it in place.

Remote Control for JFS Speed Changers

PUSH-BUTTON control of the speeds of conveyors and other machines equipped with JFS variable-speed reducers has been developed by the Stephens-Adamson Mfg. Co., Aurora, Ill.

Ordinarily speeds are regulated by means of a handwheel on the reducer, but when the drive is located overhead or in a corner or other inaccessible place, such control becomes difficult. For such conditions the push-button remote control arrangement is an advantage. The usual hand control is replaced by a spur gear which is driven forward or backward by means of a compact motor mounted on the base. The push-button box can be located at any distance from the drive, and the speed increased or decreased simply by pressing the proper button. As long as the "increase" button is pressed, the JFS unit continues to increase its output speed; when the speed desired is reached the button is released, the speed remaining at that rate until again increased or decreased by means of the push-button. Approximately 1 min. is required to change speed from one extreme to the other.

Where push-buttons are located at some distance from the machine, an electrical tachometer is used to show the exact speed being delivered by the JFS speed changer.


"JFS" VARIABLE REDUCER
CONSTANT SPEED MOTOR
WIRES TO C-H REMOTE CONTROL
VARIABLE SPEED DRIVE
C-H REMOTE CONTROL MOTOR TO REGULATE OPERATING SPEED
DISCHARGE END
CONTINUOUS HEAT TREATING OVEN WITH "JFS" VARIABLE SPEED DRIVE AND C-H REMOTE CONTROL

Chromium-plated high-speed steel knives for use on wood surfacing machinery are being produced by the Simonds Saw & Steel Co., Fitchburg, Mass. Tests on these knives, designated as the Red Streak planer knives, are said to indicate 25 per cent longer life and twice the cutting service between grinding.

Puller Jack Moves Load 15 Ft. at One Bite

PULLS the length of the load chain, or 15 ft., without taking a new hold, can be made with the ratchet-operated Anchor puller-jack being marketed by the T. H. Edelblute Co., Oliver Building, Pittsburgh.

The device consists of an arrangement of sprocket wheels, ratchets and pawls, operated by a 3-ft. handle. The tail chain is fastened to the anchorage and attaches to the machine by a simple release lock, through which the load can be released under full strain if desired. The load chain is hooked to the load and the loose end of the chain passes over the sprocket of the jack. By a ratcheting movement of the handle, the operator pulls on the load, and the chain passes around the sprocket, falling loosely below. The standard load chain is 15 ft. long and has a swivel in it. Longer load chains can be furnished. A sheave block included as standard equipment doubles the pulling power, and is used also for making vertical lifts and pulling around corners. The outfit can be used in any position.

THE Standard Outfit Consists of the Machine Itself, with Handle, a 15-ft. Load Chain with Slip Hook and Swivel and a 3½-ft. Tail Chain with Grab Hook and Sheave Block

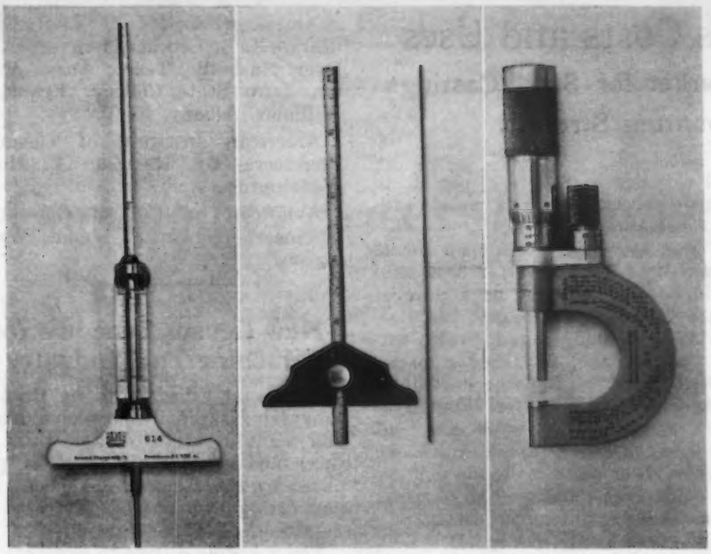
Tests are said to show that in straight-line pulling one man can pull 4800 lb., draw-bar pull, and two men can pull 6500 lb. With the sheave block one man pulled 6700 lb. and two men pulled 9800 lb.

Uses for the puller jack include moving railroad cars, pulling out mired trucks, tightening cables and wires, shifting tracks, loading and unloading heavy machinery, pulling boiler tubes, and pulling belts and chains together for splicing.

Correction

THE new utility press built by the Simplex Tool Co., Woonsocket, R. I., for bending, straightening, pressing and other shop and tool room operations, has capacity for bending ½ x 4-in. steel to a 90-deg. angle. The bending capacity given in THE IRON AGE of Jan. 30, page 377, was in error.

Heppenstall Forge & Knife Co., Pittsburgh, has changed its name to the Heppenstall Co.



Two New Depth Gages and a Novel Micrometer

A COMBINATION depth gage and drill point gage, a depth gage with two scales, and a micrometer caliper reading ten thousandths direct have been announced by Brown & Sharpe Mfg. Co., Providence, R. I.

With gage No. 614 holes up to 3 in. deep can be scaled, and the depth read either in thirty-seconds or sixty-fourths of an inch from two scales, one scribed on each side of the body shaft. A rod with cross lines at inch divisions is used. The rod has a diameter of 1/16 in. for the first ⅝ in. of its length and then increases to ⅛ in. for the remainder of its length. The small point and a base 2 in. wide make the instrument useful for either large or small holes.

The other gage, No. 617, features a drill point gage, useful in determining eccentricities in the point and checking the grinding angle. This work is done by means of a scale on the beveled top edge of the body, which forms an angle of 59 deg. with the rule. Depth readings up to 5 in. are taken from the sliding rule, which is calibrated in sixty-fourths of an inch. A rule reading metric divisions is optional. Provision is made for substituting a rod, of 0.0781-in. diameter for use in small holes. The rod is graduated either in inches or millimeters.

The new micrometer, listed as No. 24, offers readings up to one inch by ten thousandths, the last place being shown on a vernier thimble mounted below the first. Operation is substantially the same as with a regulation one thimble caliper. After turning the spindle up against the work the thousandths are read direct in the usual way. The second thimble is then revolved until the horizontal line on the barrel coincides with the graduation on the main thimble. Ten thousandths are then read from the small thimble and added to the first reading. Spacing on the secondary scale is wide enough to permit estimation of parts of ten thousandths. When occasion demands, adjustment for spindle and anvil wear can be made, and the new setting is retained by a self-locking device.

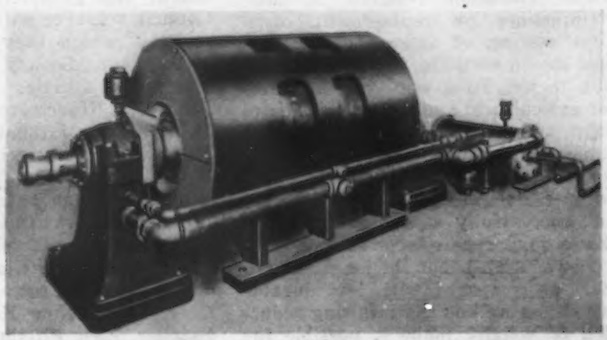
High-Speed Motor for Pump and Other Uses

CONSTANT driving at high speed is the purpose of a new type of 3600-r.p.m. induction motor which has been brought out by the Westinghouse Electric & Mfg. Co., East Pittsburgh. While this motor was designed for boiler feed pump drive, it is suitable for any direct-connected constant-speed application. Some windage noise is to be expected at such high speed, but the blowers and the entire ventilating system are designed to reduce this to a minimum and motors are comparatively quiet.

Ratings of 500 hp. up through 1250 hp. have been built and are now in service. If more power is required the line can readily be extended. The motor is said to have high efficiency and power factor, even at light loads, and the starting currents are low. Small in size, the motor requires little space and the largest one built to date weighs only 7700 lb.

One-piece punchings of silicon steel are used in both stator and rotor and the primary slots are the familiar open type, facilitating removal and replacement of coils. The primary coils are completely formed and insulated before being placed in the slots. The coils are tightly wedged in the slots and the end turns are so rigidly braced that the motors may be started on full voltage.

The rotor is all metal, practically indestructible and very carefully balanced. All are dynamically balanced and tests show them to run smoothly up to 4500 r.p.m. The bearings of these motors are pedestal type, split at the horizontal center line, making it possible to remove the bearing without dismantling the motor. They are lubricated by oil, under pressure, supplied by a positive-feed pump which is driven from the motor shaft through gears. Labyrinth seals and felt washers protect the bearings from dust and dirt.



INDUCTION Motor with Speed of 3600 R.P.M. Blowers and ventilating system reduce windage noise to minimum

Exhibiting a 3,000,000-lb. Universal Testing Machine

A completely erected 3,000,000-lb. universal testing machine, equipped with an A. H. Emery hydraulic weighing system, will be available for inspection at the plant of the Southwark Foundry & Machine Co., 400 Washington Avenue, Philadelphia, until Feb. 21.

This machine, to be shipped to the University of Illinois, is said to be one of the largest universal testers ever built. It has a maximum opening of 38½ ft. for tension and compression specimens, and a stroke of 36 in. The clear distance between the columns is 7½ ft. The Emery weighing system in the central crosshead accommodates transverse specimens limited in length only by the size of the building in which the testing machine is installed. With the machine, which is of single-cylinder type, will be shown a centralized control cabinet containing dials, recorder and all remote electric and hydraulic controls.

Following the example of a number of other companies, the Square D Co., Detroit, announces that henceforth all accounts, salaries and internal records of the company will be handled on the basis of a 13-period year, replacing the former method of calendar months.

Steel Founders Discuss Costs and Uses

Opportunities for Widening Market for Steel Castings and Uniform Cost Accounting Stressed

MORE than 100 steel foundrymen were present at the January meeting of the Steel Founders' Society of America held last week at Hotel Sherman, Chicago.

The cost committee of the society met in all-day session for the purpose of revising, improving and simplifying the present uniform cost finding practice for steel foundries. The skeleton structure and basic principles of a new plan were tentatively adopted. When the committee's work has been completed, the industry will have a standard method of computing costs, flexible enough to fit conditions existing in various types of foundries, large and small.

Society Developing Code of Trade Customs

The industrial research committee, of which Harold S. Falk, Falk Corporation, Milwaukee, is chairman, met for the purpose of developing a standard set of trade customs for steel foundries. Considerable progress was made in the development of a code, which will define the conditions under which steel castings are bought and sold. More than half of the items to be considered were tentatively approved. Clark McKercher, counsel for the society, is cooperating with the committee in this work.

With Arthur Simonson, vice-president, and chairman of the Midwest-Southern division of the society, presiding, the general session opened with a report by the managing director, Granville P. Rogers, who stated that the membership had been materially increased since the last meeting. He reported the society's employment and placement bureau functioning successfully. The auditor's report showed the society in a sound financial condition.

Many New Uses Described

A feature of the session was the presentation by members of instances in which other products had been supplanted by steel castings. It was shown that castings could be made to replace equipment previously constructed of built-up structural shapes, either riveted or welded together, where vibration resulted in high maintenance or replacement costs. Unit casting of assembled members was shown to make possible a reduction in weight in some cases. Parts for agricultural and automotive equipment, tractors and machines that are subject to breakage are logical jobs for the steel foundry, it was declared, because steel castings can be readily and successfully welded in the event that a quick repair becomes necessary.

It was stated that the longer life of steel as compared with less durable metals, as well as the resulting reduction of weight, make it possible for steel castings at 8 to 15c. per lb. to compete successfully with metals selling for 4 and 5c. per lb.

It was agreed that an open forum on new uses discovered for cast steel would be of real value as a part of future programs of society meetings.

C. A. McDonald, Nugent Steel Casting Co., Chicago, delivered a paper entitled "Cost of Repair or Maintenance Labor in the Steel Foundry," which stressed the importance of foundries carefully checking to see whether lower costs made possible by new equipment purchased were offset by increased maintenance costs.

William Donnelly, George H. Smith Steel Casting Co., Milwaukee, advocated adherence to a set of uniform customs regarding pattern equipment and the insistence on foundries receiving patterns of proper design and construction, in a paper captioned "The Complete Handling of Pattern Equipment by Steel Foundries."

L. S. Peregoy, Sivyer Steel Casting Co., Milwaukee, was elected permanent chairman of the small castings division of the society.

The large casting division of the society met to study and analyze the monthly operating data reports of the members of the group.

Engineering Council Names Administrative Board

Selection of administrative officers to carry out plans for national activity in public affairs during 1930 is announced by the American Engineering Council.

Major Gardner S. Williams, of Ann Arbor, Mich., vice-president of the Council and representative of the Detroit Engineering Society, has been named acting president. He will occupy the office until the return from a trip around the world of Carl E. Grunsky, San Francisco, former president of the American Society of Civil Engineers, who has been elected president for a two-year term, succeeding Arthur W. Berresford, of New York.

New members of the administrative board, the governing body of the Council, together with the constituent societies which they represent, are:

American Society of Mechanical Engineers—Charles Piez, Chicago; John Lyle Harrington, Kansas City, Mo.; R. C. Marshall, Jr., Chicago; E. N. Trump, Syracuse, N. Y.; John H. Lawrence, New York; D. Robert Yarnall, Philadelphia.

American Institute of Electrical Engineers—C. O. Bickelhaupt, Atlanta, Ga.; H. A. Kidder, New York; R. F. Schuchardt, Chicago; Prof. C. F. Scott, New Haven, Conn.; C. Skinner, East Pittsburgh.

American Society of Civil Engineers—H. S. Crocker, Denver; A. J. Dyer, Nashville, Tenn.; Anson Marston, Iowa State College; Frank M. Williams, Albany, N. Y.

American Institute of Chemical Engineers—Dr. Harrison E. Howe, Washington.

American Institute of Consulting Engineers—Edwin F. Wendt, Washington.

New Census Schedule for Machine Tool Industry

A special schedule to be used in canvassing the machine tool industry and manufacturers of dies, jigs, fixtures and small tools has been prepared by the Bureau of Census, Department of Commerce, for the 1929 Census of Manufactures.

The schedule covers 15 separate inquiries. In the letter of explanation to be sent with the schedule, the following special instructions appear:

"Inquiry 9, 'Products,' has been arranged in three groups representing: 1, complete machine tools, the primary products of the industry as constituted at prior censuses; 2, attachments and fixtures (dies, jigs, etc.); and 3, miscellaneous small tools. (The term 'machine tools' as here used refers to machines complete with standard equipment. All special attachments, fixtures, and accessories made for separate sale as such and not as parts of complete machines are to be reported separately where indicated on the schedule.) Data for all attachments and accessories bought by the plant for resale with machines should not be included in this report. Separate statistics for each of these groups will be presented in the published reports."

This is the first time that the Bureau has collected special data relative to Groups 2 and 3. The collection of such data at the census for 1929 is said to have been urgently requested by both individuals and manufacturers' associations.

Allegheny Steel to Spend $500,000 on Improvements

The Allegheny Steel Co., Brackenridge, Pa., will spend $500,000 on improvement of plants this year, according to H. E. Sheldon, president. During $1929, $1,500,000 was expended at the works at Brackenridge and Tarentum, Pa. The expenditures during 1929 resulted in the remodeling of some of the operations which increased their capacity and increased the efficiency of the entire plant. A considerable portion of this money was spent on the properties of the West Penn Steel Co., which were acquired last year. The improvements during 1930 will not be applied to any specific department, as it is felt that this amount can be spent advantageously in the betterment of equipment and furnaces.

Commodity Prices Show a Downward Trend

BY LEWIS H. HANEY
DIRECTOR, NEW YORK UNIVERSITY BUREAU OF BUSINESS RESEARCH

THE writer has long noted that finished steel prices bear a close relation to the general level of commodity prices as indicated by the Bradstreet index, and that when finished steel prices become relatively high, the peak of a business cycle is generally indicated. This was true in the spring of 1920, early in 1923, and in the spring of 1926. By April, 1929, there was again a sufficient spread to indicate the approach of a recession.

THE IRON AGE composite of finished steel prices is now the highest in comparison with the Bradstreet index since July, 1924. The spread is similar to that found in June, 1920, and in March, 1923. Certainly this constitutes a maladjustment.

The Bradstreet index decreased 1.4 per cent in January, only live stock and provisions showing increases. It was 11.3 per cent below a year ago, and the lowest since February, 1922. Finished steel prices at the end of January were 2.305c. a lb., against 2.362c. at the end of December. The January average was only 3.8 per cent under a year ago, and was the lowest since July, 1928. Pig iron prices were a little lower, averaging $18.19 in January, against $18.23 in December. Steel scrap, at $16.69 in January, compares with $16.50 in December, but except for December, showed the lowest monthly average since August, 1928.

(1) In general business, a temporary spurt is occurring, but this is largely seasonal. No sustained recovery is probable until the general level of commodity prices turns upward and some progress is made toward restoring the normal balance between steel prices and the general level.

(2) Finished steel prices are likely to decline moderately. The situation is somewhat similar to that found in early 1924, but steel prices are lower than then and not so much out of line with other prices.

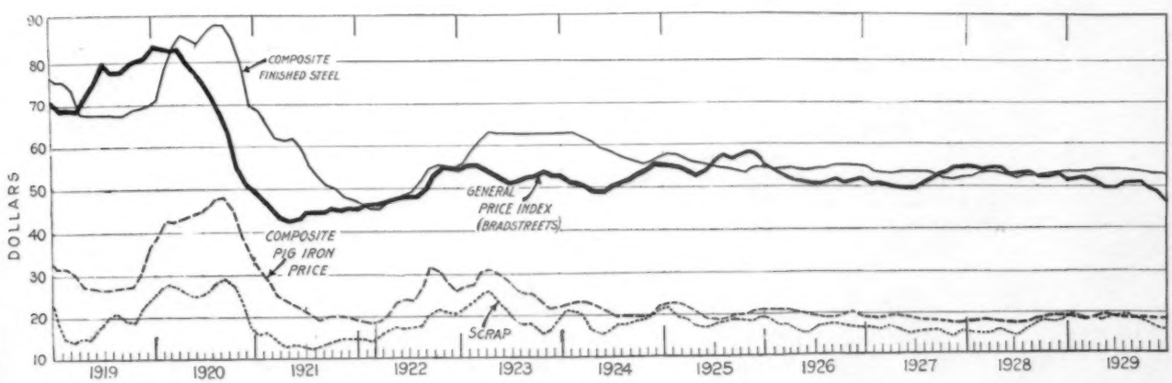
(3) Pig iron production is large in comparison with steel making requirements, and pig iron prices are rather high in comparison with finished steel. As similar conditions have usually attended a decline in the pig iron markets, there is some reason to look for lower prices, although a temporary recovery seems possible.

(4) The rise in steel scrap prices as reflected in the January average appears to be a seasonal occurrence. Scrap prices often turn weaker in February. Judging by the chart, we would say that the scrap markets are likely to work irregularly lower, perhaps through May.

The general trend of commodity prices is downward and notably so in the case of raw materials. This is disturbing and unfavorable for the near future. For the long run, however, the lower raw material prices are constructive. During the past year raw material prices have tended to gain on the prices of finished goods, resulting in narrower replacement margins in many industries. Ultimately, therefore, the cheaper raw materials will allow more attractive finished goods prices (from the consumers' point of view) and better profit margins for manufacturers.

The foregoing opinions and conclusions must be regarded as extremely tentative, chiefly because of the extraordinary amount of concerted action among producers with reference to prices, to some extent with the cooperation of governmental agencies.

Doctor Haney will discuss in the next issue the position of the producers of iron and steel.



The Spread Between Steel Prices and General Commodity Prices Is the Highest Since July, 1924, and Is Believed To Be In For Readjustment

This Issue in Brief

Virtually eliminates skilled labor and manual labor cost in enameling stove parts. Electric furnaces, automatically controlled, work with mechanical accuracy. Conveyor systems make the racking of parts between operations unnecessary.—Page 497.

* * *

For uniform results in heat-treating chromium steel parts, a special annealing furnace is necessary, says metallurgist. Unobtainable in box-type furnace, he says, because cooling rate varies from the center to outside of a pile of parts.—Page 507.

* * *

"Vibration failure" of sheet steel fabricated fittings used in aircraft construction is due to poor bending properties of the steel. Even if actual bend in the fitting be as low as 30 to 90 deg., overstrained condition on the outside of bends results in small cracks, almost invisible. — Page 503.

* * *

To avoid difficulties in machining gears made from chromium steels, annealing should be carefully regulated. Otherwise, a mixture of pearlitic, sorbitic and spheroidized structure will result. —Page 506.

* * *

Enameling uniformity is obtained by use of rotating, circular furnace. Constancy of temperature is maintained. Length of firing time is controlled by the hearth speed, and can be varied according to the thickness of the metal being fired.—Page 495.

* * *

Less scaling and volume change in heat treating result from the use of nickel steel. Each per cent of nickel lowers the initial point between 30 and 40 deg. Fahr., which is advantageous, as it results in low quenching temperature.—Page 506.

Avoid drawing temperatures between 475 and 700 deg. Fahr. for chromium steel parts, as this range produces brittleness. Probably due to structural changes, decomposition of the austenite to martensite.—Page 507.

* * *

Hardening results are greatly influenced by method of melting the steel. Low-carbon structural steel fails to yield even to the most drastic heat treatment if an incompletely deoxidized steel is used.—Page 510.

* * *

Machining properties vary more in a flat forged gear than in an upset gear, says metallurgist. Upsetting produces a more uniform grain flow.—Page 506.

* * *

X-ray reveals that 75 to 90 per cent of defects in steel castings can be avoided by proper foundry practice. Undesirable internal conditions fall into seven major classes.—Page 501.

* * *

To prevent scale in hardening chromium steel parts, use a salt bath containing 25 per cent cyanide. No decarburization occurs so long as the cyanide content is above 20 per cent.—Page 507.

* * *

For maximum hardness, the best average quenching temperature of low-carbon structural steel is 1600 deg. Fahr. Manganese content of at least 0.60 per cent is essential for satisfactory heat treating.—Page 510.

* * *

Stronger gray iron castings at low cost can be made, it is claimed, from electric pig iron containing alloys. Titanium content prevents loss of vanadium. Vanadium makes a stronger and longer wearing casting.—Page 508.

Single quench for carburized gears gives excellent results. Temperature should be somewhere between the ideal theoretical temperatures for the case and the core; just high enough to put the core in solution, and time factor as short as possible.—Page 508.

* * *

Equal strength in length and breadth of sheets is obtained by cross-rolling. Final rolling is done with sheet at 90 deg. to previous rolling. Fittings fabricated from these alloy steel sheets for aircraft use give high resistance to vibration, and may be welded without serious loss in tensile strength.—Page 502.

* * *

Distortion or buckling during enameling is avoided, even when parts are heated quickly to maximum temperature, by use of rotary furnace. Cold parts are introduced into cool zone and brought gradually into and away from fusing zone.—Page 496.

* * *

Can cut machining cost of heat-treated parts produced in quantity if heat-treating conditions are kept uniform. After annealing cycle is set up, a specific number of parts should be machined to size, checked and marked for proper identification before heat treatment, and then rechecked after. Dimension changes can then be allowed for in machining. —Page 507.

* * *

In welding alloy sheet steel parts to be heat treated for maximum strength, one must get complete fusion of the weld metal into the corner of the abutting sheets, in case of a "T" weld. The fillet should be built up so that the shearing stresses in the weld metal are not more than half of the tensile stresses in the base.—Page 504.

Iron Tools and Tongs of the 1860's

DOVER FORGE was one of the last of the old bog ore forges to be operated in South Jersey. It was located on the headwaters of Cedar Creek in Ocean County, N. J., and was erected in 1810 to 1811 by William L. Smith, a son-in-law of Gen. John Lacey. Following Smith came Joseph Austin as owner. He operated the works until his removal to Ohio about 1850, when his son Joseph, who had been conducting the Hampton Forge, took it over and continued its operation until about 1868, when it was abandoned. From Charles S. Boyer, Camden, N. J., the following information has been obtained:

The works contained two hammers, four fires, and a stamping mill for reducing the magnetic ore and cinder mass to such a size that it could be readily melted by the forge fire. In making the larger forgings, the semi-molten iron was taken from the forge fire and first formed into a "pillow shaped" mass by hammering with a wooden maul until it had been reduced to the proper dimensions to go under the tilting hammer, where it was worked into the desired form.

The hammers were about 14 in. square and 3 ft. in height with a square hole near the upper end, through which the heavy beam was inserted. The beam was pivoted about midway of its length so that it could tilt up or down. The power was applied at the end opposite the hammer. On the circumference of a heavy wheel directly connected with the water-wheel were four lugs or teeth, one of which would engage the hammer beam and, by pulling the free end down, raise the hammer to the required height and then let it drop with a mighty blow on the anvil. The speed of the hammer blows was regulated by the flow of water under the wheel.

The bellows which furnished the air blast for the forge fire consisted of two drums, about 6 ft. in diameter and 6 ft. high, made of small pieces of maplewood about 1½ in. wide and 18 in. long, fitted and glued together to make a perfect circle and then layer after layer built up to the required height. Each drum had a tight-fitting bottom with a leather inlet air valve and an air blast outlet pipe and a circular plunger around the circumference of which was fastened a leather strip to make an air-tight closure. The plungers were moved up and down by a vertical shaft running through the casings and attached to a tilting beam operated by the water-wheel in a similar manner to the hammer. An almost continuous air blast was furnished by the alternate strokes of the plungers.

Some of the Old Tongs and Tools of Dover Forge, New Jersey, Used in the 1860's.

Recently a number of tools and tongs, shown in the illustration, used in these works, were uncovered from the debris of the fire. They are probably the ones used during the later days of its operation, dating back in the 1860's. Along the tail race was also found a pair of wooden bellows, such as were used in many of these forges.

Vanadium Steels for Railroad Springs

THREE examples of improved service, when chrome-vanadium steel is substituted for high carbon spring steel, are given in *Vancoram Review* for January:

To improve the riding quality of dining cars, alloy steel springs with deflection of 5⅛ in. under a stress of 112,000 lb. per sq. in. and 68 oscillations per min. were substituted for carbon steel springs deflecting 3 in. at maximum static stress of 93,000 lb. per sq. in. and 85 oscillations per min. Notwithstanding the higher stresses, the chrome-vanadium steel spring design has shown in service an actual life of about five times that of the carbon steel design which fact, together with a saving in weight of 160 lb. per car, resulted in an economical practice in spite of the higher initial cost of the steel.

Alloy steel springs were installed in electric cars for suburban service to save weight and space for necessary motor appurtenances. In this design the static deflection was kept the same in the chrome-vanadium spring as in the carbon steel spring (i.e., 3.08 in.). The alloy spring, however, was 30 in. long instead of 32 in., and saved over 400 lb. per car. The actual service life was increased about three times. The total saving from these combined effects was approximately $200 per car.

In another instance, on a railroad operating under particularly adverse conditions for spring service, the life of carbon steel locomotive driving springs was from three to five months before replacement was necessary from settling or breakage. With chrome-vanadium springs on these same locomotives no failures have been reported during the two years they have been in service.

Potash in 1928 is the subject of an 8-page bulletin of the United States Bureau of Mines. Tables show the production over a period of years, the general sub-division according to uses and a summary of world production from 1924 to 1928 inclusive. Prices are shown in one table.

Management and Materials Handling

Chicago Meeting of Mechanical Engineers to Have Comprehensive Program of Papers and Plant Inspections

TWO groups in the American Society of Mechanical Engineers are cooperating in a joint meeting, to be held at the Hotel Stevens, Chicago, March 3 to 7. The first, "National Management Congress," will be in session March 3, 4 and 5, while the third, "National Materials-Handling Meeting," will occupy March 5, 6 and 7. The two previous national meetings of this group were held in Detroit and Philadelphia, respectively. In the basement of the hotel will be, at the same time, the National Industrial Equipment Exposition, with exhibits of materials-handling apparatus and many mechanical aids to management.

Programs of the two meetings follow:

Management Congress

March 3.—"Development of the Art and Science and Philosophy of Management Since Taylor," by Henry P. Kendall, president, Taylor Society.

"Economic and Social Factors Which Management Must Consider in the Future."

"The Trade Association's Opportunity in Promoting Better Management," by Hugh P. Baker, director, Trade Association Division, United States Chamber of Commerce, Washington.

"Problem of Waste," by Virgil Palmer, Eastman Kodak Co.

"An Effective Method of Reducing Waste," by C. B. Auel, Westinghouse Electric & Manufacturing Co.

Symposium on Concrete Savings and Methods of Waste Reduction: W. B. Ferguson, Newport News Shipbuilding & Dry Dock Co.; A. C. Wilby, Assistant president, Universal Atlas Cement Co.; R. Chalmers and W. E. Roe, Oakland Motor Car Co.; R. W. Phillips, DuPont deNemours & Co.

Progress in Distribution Methods

Control of Distribution

What's Ahead in Retail Distribution?

"Simplification and Mechanization in the Administrative Field," by W. H. Leffingwell, New York.

"Making Most Effective Use of Equipment," by Thomas R. Jones, vice-president, Harris-Seybold-Potter Co., Cleveland.

"Measuring Office-Machine Output as a Basis for Wage Incentive," by John Mitchell, General Electric Co., Schenectady, N. Y.

"Mechanization and Simplification in Production Control," by E. J. MacDonald, Temporator Co., Chicago.

March 4.—Plant Maintenance; L. C. Morrow, editor, *Industrial Engineering*, Chicago, chairman. Speaker, R. R. Reese, plant engineer, Packard Motor Car Co., Detroit.

"A New Type of Director—The Management Engineer," at the Management Get-Together Luncheon.

Wage-Incentive Plants; J. M. Carmody, chairman.

"Management Factors and Responsibilities Preliminary to and Coincident with Installation and Operation of Wage Incentives," by W. P. Tuttle, Edison Electric Appliance Co., Chicago.

"Executive and Cost Phases of Wage-Incentive Plans," by John Paul Jones, Standard Oil of Indiana, Chicago.

Managerial Education and Training Session; Hugo Diemer, La Salle Extension University, chairman.

How a Group of Managers Studied Management.

What Is Industry Doing to Train Future Managers? Speakers: R. H. Spahr, General Motors Institute, Flint, Mich., W. T. Galloway, Middle West Utilities.

"Apprentice Training," by C. J. Freund, Falk Corporation, Milwaukee.

March 5.—Readjustments of the Machine Age.

What Is Done with an Oversupply of Employees?

Plant visits, Tuesday and Wednesday afternoons, include Crane Co., Joseph T. Ryerson & Son, Swift & Co., Teletype Co., Stewart-Warner Corporation, and the provision yards of the Chicago & Northwestern Railroad. The banquet on Wednesday evening will be participated in by both the management and the materials handling members.

Materials-Handling Meeting

March 6.—*Conveyor and Pneumatic Handling Session;* chairman, Jervis B. Webbs, president, Jervis B. Webb Co., Detroit.

"Conveyor Handling Methods of the Chicago *Daily News*," by Matthew W. Potts, engineer, Alvey-Ferguson Co., New York.

"Use of Portable Conveyors," by E. L. Benson, manager, conveyor division, Barber-Greene Co., Aurora, Ill.

"Pneumatic Handling of Coal and Other Materials," H. H. Weiss, Brady Conveyor Corporation, Chicago.

Manufacturers and Users Luncheon; chairman, M. W. Potts, secretary, Materials - Handling Division, A.S.M.E. and associate editor, *Materials Handling and Distribution.*

Need of Standardization in the Material-Handling Field.

Preliminary Report of the Information and Data Committee on Coordination and Cooperation in Materials-Handling Field.

Industrial Truck and Tractor Session; chairman, Charles B. Crockett, secretary, Industrial Truck Association, New York.

"Shipment of Goods on Skid Platforms," by F. J. Shepard, Jr., treasurer, Lewis-Shepard Co., Watertown, Mass.

"Industrial Tractor-Trailer Method of Materials Handling in the Meat-Packing Industry," by A. D. Shanks, manager, Packing Industries Department, Mercury Manufacturing Co., Chicago.

"Industrial Plant Design and Operation as Effected by Transportation Between Departments," by Willard Brinton, Terminal Engineering Co., New York.

March 7.—*General Session;* chairman, Nixon Elmer, engineer, Armour & Co., Chicago.

"Coordination of Handling Equipment in the Packing Industry," by A. W. DeVout, engineer, Swift & Co., Chicago.

"Recent Developments of Materials Handling in the Merchandise Building, Kearney, N. J.," by C. K. Prevar, engineer, Western Electric Co.

"Materials Handling in an Automotive-Frame Plant," illustrated by film, by E. W. Redling, assistant works manager, A. O. Smith Corporation, Milwaukee.

Safety Luncheon; chairman, Raymond W. Dull, research engineer, Link-Belt Co., Chicago.

"Designing for Safety in Materials Handling," by R. H. Hucke, engineer, General Electric Co., Schenectady, N. Y.

Layout Session; chairman, George L. Morehead, vice-president, Link-Belt Co., Philadelphia.

"Effect of Modern Materials Handling on Materials, Inventory and Scrap," by E. J. Barney, superintendent of materials, Frigidaire Corporation, Dayton, Ohio.

"Hidden Costs in Materials Handling," by J. I. McCormick, superintendent, plant planning, Westinghouse Electric and Manufacturing Co., East Pittsburgh.

"What the Materials-Handling Equipment Manufacturer Needs to Know to Make a Successful Installation," by N. H. Preble, Mechanical Handling Systems, Inc., Detroit.

Plant visits, Wednesday, Thursday and Friday afternoons, include Western Electric Co., Hall Printing Co., Edison Electric Appliance Co., Inland Steel Co., Chicago Underground Railway Co., State Line Generating Co., Whiting Corporation.

Simplified practice recommendation No. 67, roller bearings, has been reaffirmed without change for another year, according to the Division of Simplified Practice, Bureau of Standards. A survey disclosed that 58 per cent of the industry had adhered to the program.

Output of Fuels and Production of Power and Power Equipment

	1930 January,	1929 December,	1929 January.
Bituminous coal produced(a), net tons	49,750,000	46,200,000	51,456,000
Anthracite, net tons	6,909,000	7,658,000	7,337,000
Beehive coke, net tons	312,600	344,900	479,100
Railroad locomotives shipped(b), No.	48(c)	67	23
do. do., unfilled orders	585(d)	490	278
	December, 1929	November, 1929	December, 1928
Production of electric power by public-utility power plants(e)	8,516,464	8,249,400	8,241,000
Whereof, by water-power	2,757,827	2,641,729	.....

(a) United States Bureau of Mines.
(b) United States Department of Commerce.
(c) Lowest since last March.
(d) Highest since June, 1926.
(e) United States Geological Survey: the units are 1000 kwhr.

Dullness Persists in European Markets

Demand Poor and Prices Not Attractive—Tin Plate May Show Better Activity Soon—Wire Prices Declining on Export Orders

(*By cablegram*)

LONDON, ENGLAND, Feb. 10.

CLEVELAND pig iron markets are dull and it is probable that more blast furnaces will be banked in the near future, as several steel furnaces have been closed down. Fuel has been cheapened further and consumers, in consequence, are looking for cheaper pig iron, but makers are not reducing their prices except for Scottish business.

Foreign iron is competing and it is possible that Scotland may buy 10,000 tons of French foundry iron. Hematite is quiet and furnacemen are desirous of getting orders, but consumers are buying only sparsely, in anticipation of lower prices.

Finished steel demand is still poor and is confined mainly to domestic users. Export business is difficult to obtain, especially in heavy materials.

Tin plate markets are quiet as regards business, but there is fair inquiry, suggesting that buyers may be holding back. Those works which are in the pooling scheme are well sold for the current quarter and have made some sales into the next quarter. Hence the makers' position is sound.

There is further weakness in evidence in the galvanized sheet market, as Indian demand is still stagnant and the works are in need of orders. Demand for black sheets is generally meager.

On the Continent of Europe

Continental markets are quiet, awaiting decisions of the Cartels. Only the Belgian works, at present, are willing to book orders. Users in Britain [of Continental semi-finished materials] show little interest, owing to the continued dullness of the sheet steel trade.

It is expected that the European Raw Steel Cartel will be renewed for an added period of 10 years.

Rod Cartel Allocates World Markets

HAMBURG, GERMANY, Jan. 27.—To reduce competition, which was leading to a lower level of prices, foreign markets have been distributed among the members of the Continental Wire Rod Cartel. The British, Japanese and Canadian markets have been allocated, and the American and Scandinavian markets are under discussion. It is understood that Canada will be equally divided between France and Belgium, as Germany has no treaty of commerce with Canada. Germany is reported to have been allocated 40 per cent of the Japanese market, Belgium 20 per cent, France 30 per cent, and other members 10 per cent. No decision has been reached on allocating the market in the United States, but it has been suggested that 50 per cent be given to Belgium, 25 per cent to Germany and that the remaining 25 per cent be distributed among other members.

German Wire Rope Makers to Unite for Export

HAMBURG, GERMANY, Jan. 27.—The German Wire Rope Cartel has made an agreement under which members that formerly exported less than 100 tons of wire rope annually will abandon their foreign trade and as compensation will receive a larger domestic allotment. The other members are negotiating to establish an export selling organization, with foreign offices and agencies. Recently the cartel purchased four small manufacturing companies and closed the plants, distributing the production to the allotments of the remaining makers.

Spain May Organize Steel Cartel

DÜSSELDORF, GERMANY, Jan. 24.—Establishment of a steel cartel similar to the German organization is being considered by producers in Spain. At a "steel week" recently held in Bar-

British and Continental European Export Prices per gross ton, f.o.b. United Kingdom Ports, Hamburg and Antwerp, with the £ at $4.8665 (par)

British Prices f.o.b. United Kingdom Ports

Cleveland No. 3 foundry	£3	12½s.	to	£3	13½s.	$17.64	to	$17.88
East Coast hematite	3	18	to	4	0	18.98	to	19.47
Ferromanganese, export	12	5	to	12	15	59.61	to	62.05
Billets, open-hearth	6	2½	to	6	12½	29.81	to	32.24
Sheet bars, open-hearth	5	17½	to	6	5	28.59	to	30.42
Black sheets, Japanese specifications	12	10				60.84		
Tin plate, per base box	0	18⅝	to	0	18½	4.47	to	4.50
Rails, 60 lb. and heavier	7	15	to	8	15	37.72	to	42.58
						Cents a Lb.		
Steel bars, open-hearth	8	0	to	8	10	1.74	to	1.85
Beams, open-hearth	7	7½	to	7	17½	1.60	to	1.71
Channels, open-hearth	7	12½	to	8	12½	1.66	to	1.87
Angles, open-hearth	7	7½	to	7	17½	1.60	to	1.71
Ship plates, open-hearth	7	15	to	8	5	1.68	to	1.79
Black sheets, No. 24 gage	9	15	to	10	0	2.12	to	2.17
Galvanized sheets, No. 24 gage	11	15	to	12	0	2.55	to	2.61

Continental Prices, f.o.b. Antwerp or Hamburg

Foundry iron, 2.50 to 3.00 per cent sil., 0.50 to 0.90 per cent phos.	£3	6s.	to	£3	10½s.	$16.06	to	$17.15
Foundry iron, 2.50 to 3.00 per cent sil., 1.00 per cent and more phos.	3	4	to	3	5	15.58	to	15.82
Billets, Thomas	4	11	to	4	12½	22.14	to	22.51
Sheet bars, Thomas	4	11	to	4	13	22.14	to	22.63
Wire rods, low C., No. 5 B.W.G.	6	2	to	6	4	29.69	to	30.19
Rails, 60 lb. and heavier	6	8½	to	6	10*	31.27	to	31.63
Rails, light	6	0				29.20		
						Cents a Lb.		
Steel bars, merchant	5	5	to	5	6	1.16	to	1.17
Steel bars, deformed	5	3	to	5	5	1.14	to	1.16
Beams, Thomas, British standard	5	0	to	5	4	1.10	to	1.15
Channels, Thomas, American sections	5	12	to	5	14	1.24	to	1.26
Angles, Thomas, 4-in. and larger, over ⅝-in. thick	5	0	to	5	6	1.10	to	1.17
Angles, Thomas, 3-in.	5	6				1.17		
Ship plates open-hearth inspected	7	0	to	7	5	1.54	to	1.60
Black sheets, No. 31 gage, Japanese	12	2	to	12	3	2.67	to	2.68
Hoop and strip steel over 6-in. base	5	11½	to	5	12½	1.23	to	1.24
Wire, plain, No. 8 gage	7	0				1.55		
Wire, galvanized, No. 8 gage	8	7½				1.85		
Wire, barbed, 4-pt. No. 12 B.W.G.	11	0				2.43		
Wire nails, base	7	2½				$1.57 a keg		
Wire nails, assortments 1 to 6-in. keg	10	6½				2.28		

*Open-hearth steel, 8s. ($1.95) a ton extra.

celona, Spain, there was discussion of rationalization and concentration of the industry. An effort will be made to increase export trade in steel products, and heavy expenditures for modernization of plants and purchase of new equipment are planned for the coming year.

German Steel Output Mostly in Rheinland

HAMBURG, GERMANY, Jan. 27.—The importance of Westphalia and the Rheinland in German steel output is more marked today than in 1913. Of the German steel output in 1929, totaling 11,285,080 metric tons, 84.4 per cent came from these districts, central Germany contributing 7.9 per cent, Silesia 3.2 per cent, Saxony 3.2 per cent and south and northeastern Germany the remaining 4.5 per cent. Of the pre-war output of steel 69.8 per cent was in Westphalia and the Rheinland.

European Export Prices on Wire Declining

HAMBURG, GERMANY, Jan. 27.—Export prices for wire have again been reduced 2s. 6d. (61c.) a ton. Recent sales have brought out the lowest prices since the war, with more reductions in prospect. International agreements among European producers of wire are believed to be impossible at present. Prices paid recently figure back to £7 a ton (1.52c. per lb.) for bright wire, £7 7s. 6d. to £7 9s. a ton (1.61c. to 1.62c. per lb.) for annealed wire, and £10 18s. to £10 19s. per ton (2.37c. to 2.38c. per lb.) for barbed wire, all f.o.b. Hamburg or Rotterdam.

German Yard Builds Private Yachts for Americans

HAMBURG, GERMANY, Jan. 27.—Further contracts for large private yachts to be built for Americans have been booked by the Germaniawerft at Kiel, controlled by the Friedrich Krupp A. G. These contracts will bring the total number of private yachts built by this yard for Americans since the war to 18, of which one was of 3000 deadweight tons, the largest afloat, and the average was more than 900 tons.

Comprehensive Gage Catalog

In binding, general make-up and large amount of useful data, the new 160-page, 5 x 7½-in. gage catalog recently issued by the Pratt & Whitney Co., Hartford, Conn., is a creditable achievement. Its stiff embossed cover is of leatheroid, and the printing, in two colors, is on coated stock.

General data include an outline of the work of the American Gage Design Committee, with glossary of gage terms, and a summary of the standardization program of the American Petroleum Institute. Tables of the National Screw Thread Commission's standards are also included. The approved practice for determining pitch diameter by the three-wire method is given, as well as recommended wire sizes for checking 60-deg. threads. Useful reference tables at the rear of the book include constants for finding pitch diameter and minor diameter of screw threads and thread gages, and basic thread dimensions and tap drill sizes for different forms of thread.

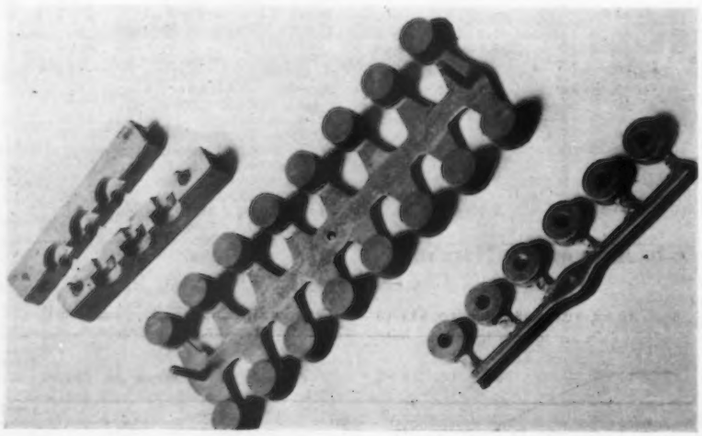
P & W products described and illustrated, and in most cases priced, cover Hoke gage blocks, and a variety of cylindrical and thread gages made to standards recommended by the American Gage Design Committee. The latter include the Taperlock and Trilock plug gages, which take their names from the method of locking the handle, and also DL gages, made of special wear-resistant material. Special thread gages for Whitworth, sharp V, and other special threads, as well as American standard pipe thread gages, are shown. Separate sections are devoted to railroad, oil-country and miscellaneous gages. The latter comprise gages for interchangeable manufacture, a camshaft comparator, precision levels, taper gages, end-measures, spline gages and star gages.

The company's standard measuring machine for checking master gages, and its Super Micrometer, a shop instrument for direct measurements up to 0.0001 in., are described. A section is also devoted to Trusform adjustable limit snap gages, and setting plugs, and adjustable limit pin gages.

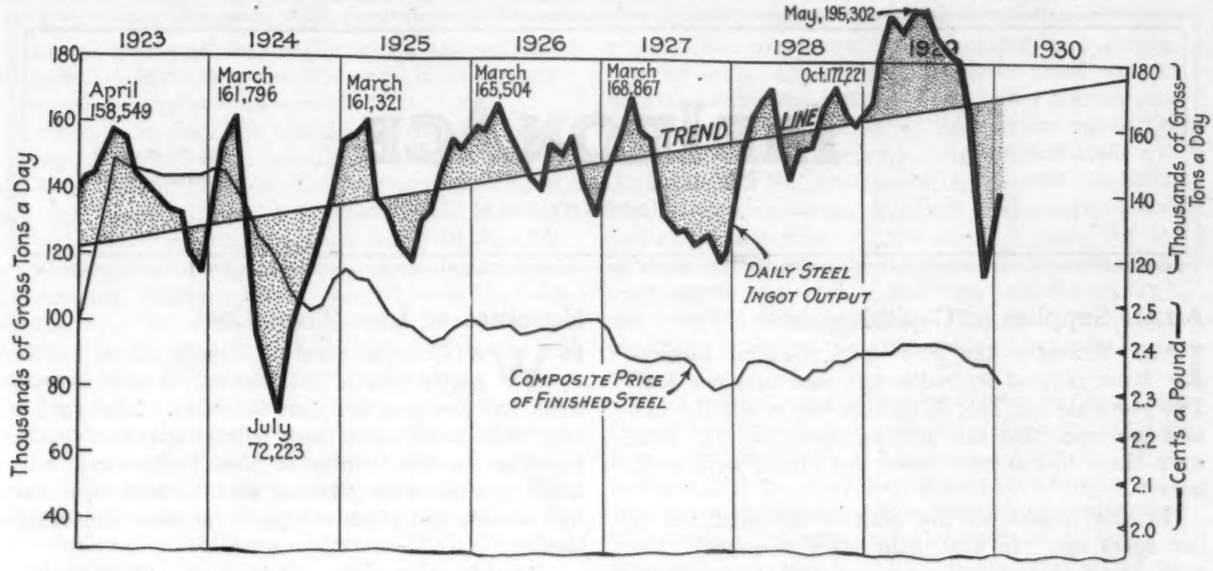
Illustrates Wisdom of Consulting with One's Foundry

FREQUENTLY certain types of equipment used by a foundry lend themselves to unusual money-saving designs in pattern construction, according to J. D. Judge, works engineer, Hamilton Foundry & Machine Co., Hamilton, Ohio. Many casting purchasers, who have on their staff men who are grounded in the fundamentals of foundry practice, nevertheless, he says, make it an invariable rule to consult foundries in designing new equipment or changing older equipment.

Some casting consumers, rather than consult their foundry source, adopt a policy of using "their best judgment." As illustrating one example of this type he offers the accompaying illustration. The customer was in the market for some small "washer" castings approximately ¾ in. in diameter, ¼ in. thick with a ¼-in. hole extending through the casting. Evidently the question was advanced as to whether or not the hole could be made in green sand. Someone with limited experience, presumably, decided that such procedure was not practical and a play-safe policy was adopted. The pattern was therefore designed for use with a dry sand core and the equipment illustrated was forwarded to the foundry. Had this purchaser consulted his foundry first, the foundry would have pointed out the fact that the dry sand core was not necessary and patterns for green sand molding could have been originally made up. Thus the expense which the casting buyer was put to in redesigning the original equipment and changing it over for proper and economical production could have been saved.



Ingot Output in January Made a Good Rebound from the Low December Level. The production curve is still far below normal, however. Finished steel prices are 3½ per cent below those of a year ago.



Good Recovery in Steel Ingot Output

January Production at Rate 21 Per Cent Higher Than December, but 15 Per Cent Below January, 1929—Open-Hearth Showed Most Improvement

PRODUCTION of steel ingots in January was almost 900,000 tons higher than in December, accounted for in part by two extra working days. In the 27 days in January the calculated output is given by the American Iron and Steel Institute as 3,786,319 tons, compared with 2,896,269 tons in 25 working days in December. It compares with 4,490,354 tons in January, 1929, with the same number of working days, that figure being the highest for any January in our history.

Daily Tonnage Increases

On the daily basis January showed an average of 140,234 tons, a gain of about 21 per cent from the 115,851 tons daily in December. This compares with 166,309 tons in January, 1929. Except for December and November, the recent figure is the lowest daily average since December, 1927, and it is the lowest for January since 1924.

Open-Hearth Up One-Third

Both open-hearth and Bessemer steel showed improvement over December, the reported tonnage of open-hearth ingots having been 3,136,878, a gain of 32 per cent over December. Bessemer ingots, reported at 441,572 tons, showed a gain of 22½ per cent over December.

Electric and crucible ingots are not included in these totals. Production of these two types of steel in 1928 averaged about 1480 tons a day. Some such figure would have to be added to the daily output to obtain the total ingot production of the United States.

In the diagram are traced the course of ingot production and of finished steel prices since the beginning of 1923. The table gives the monthly output, as reported by the institute, for the past 13 months.

PRODUCTION OF OPEN-HEARTH AND BESSEMER STEEL INGOTS
(GROSS TONS)

Months	Reported by Companies Which Made 94.51 Per Cent of the Steel Ingots in 1928		Calculated Output of All Companies		No. of Working Days	Percentage Operation
	Open-Hearth	Bessemer	Monthly	Daily		
Total, 1928..	40,538,657	6,591,217	49,865,185	160,338	311	85.05
1929						
January	3,694,218	549,616	4,490,354	166,309	27	84.80
February	3,599,224	489,279	4,326,000	180,250	24	91.91
March	4,183,869	596,691	5,058,258	194,548	26	99.20
April	4,026,576	640,351	4,938,025	189,924	26	96.84
May	4,276,186	707,484	5,273,167	195,302	27	99.59
June	3,990,798	622,585	4,881,370	195,255	25	99.56
July	3,922,532	649,950	4,838,093	186,080	26	94.88
August	3,988,729	668,023	4,927,258	182,491	27	93.05
September	3,627,639	635,593	4,510,879	180,435	25	92.01
October	3,619,432	644,528	4,511,650	167,098	27	85.21
November	2,797,488	522,672	3,513,025	135,116	26	68.90
December	2,376,775	360,489	2,896,269	115,851	25	59.07
Total, 1929..	44,103,466	7,087,261	54,164,348	174,162	311	88.81
1930						
January	3,136,878	441,572	3,786,319	140,234	27	71.51

Pennsylvania Road Program

The biennial construction program of the Pennsylvania department of highways calls for the improvement of 1500 miles of road, according to Gov. John S. Fisher. Materials required will include 35,000 tons of steel, 4,000,000 ft. of wire rope, 400,000 guard fence posts and numerous guard fence fixtures, castings, cable ends and splices.

A joint convention of the sales forces of Oster Mfg. Co., Cleveland, and Williams Tool Corporation, Erie, Pa., was held in Cleveland recently. The two companies were merged by means of reciprocal stock purchases in November, but the manufacturing and sales activities remain separate. The Williams' plant at Erie, Pa., and the Oster plant, at Cleveland, were visited by the salesmen. The Oster-Williams organization specializes in pipe machinery of all kinds.

A. I. FINDLEY
Editor

THE IRON AGE

W. W. MACON
Managing Editor

ESTABLISHED 1855

Ample Supplies of Capital

LAST Thursday the New York Federal Reserve Bank reduced its rediscount rate to 4 per cent. Two years earlier, Feb. 3, 1928, it had raised the rate to 4 per cent, that rate holding until May 18, 1928, when there was another raise, and others were made later.

In this respect we are back to the condition of two years ago. In how many other respects? The more the better, for there were good times thereafter, marred chiefly by people taking an undue and unwise interest in the stock market. As to the supply of capital, two years ago the view was that there was an ample supply. This was attested by interest rates, which had been low, by stock speculation, for there had been a "bull market" scarcely without interruption for more than three years, and by heavy investments in foreign securities.

At that time the common opinion was that if there was anything wrong with the picture it was that, while there was a large supply of capital, the source of capital, earnings, was tending to dry up. There had been poor earnings in various lines in the latter part of 1927.

But instead of that trend amounting to anything, earnings in the two calendar years 1928 and 1929 have been very large. The supply of capital might have been awkwardly large had not so much flowed into the stock market and into foreign investments. The extra amount that went into the stock market has now been released, except for a relatively small and steadily dwindling amount of "frozen credits." It certainly would seem that there is a good supply of capital.

It must always be borne in mind that it is very easy to get a distorted view as to the supply of capital by observing only what may be called the relationship of supply and demand. When there is small demand for capital a moderate supply is made to look, from this angle, like a large supply, while when there is a heavy demand a large supply may be made to appear small.

Here we are considering quantities rather than relationships. The demand this year for capital will depend upon economic and trade prospects. If these are judged to be favorable there will be demand for capital. Particularly low interest rates would be an unfavorable symptom, indicating that while there was money there did not seem to be any good way to use it. You cannot force men to make or build things merely by offering them low interest rates, for they must see their way clear to make a return in excess of the interest charge, let alone eventually paying the principal.

Novelties at Less Than Cost

"WATCH your costs!" This is old advice, repeated year in and year out by trade associations, but age does not alter its value. Disregard of costs has been particularly disastrous for smaller foundries in the vicinity of New York, which have lately specialized in novelties, such as book ends, cast iron statues and bases and parts for table and bridge lamps.

Shrewd brokers, who sell large quantities of these items to the five and ten cent stores, play one foundry against another so effectively that they usually succeed in buying their castings at less than cost to the melter. Last year a founder contracted to supply a large number of lamp parts at 50 cents each and found that he incurred a loss of 10 cents apiece. When the contract came up for renewal this plant put in a bid of 60 cents, only to find that the business was taken at 45 cents apiece.

At least two foundries doing this work have failed and others have lost heavily, but still there is no lack of low bids on new contracts. The temptation to take business to fill up one's shop is strong, particularly in slack times, but when costs are forgotten the result is inevitable.

Membership in an association will not change human nature, but at least it keeps the subject of costs foremost in one's mind—which is the first and most important step toward intelligent conduct of business. Many foundries are too short-sighted to appreciate the value of group effort or, if they do apprehend its value, are unwilling to make the necessary expenditures for initiation and dues, even when cost advice and cost experts are a part of the association service.

Cement and Structural Steel

TWO years ago we called attention to the fact that Portland cement and fabricated structural steel had had substantially similar increases in fifteen years, each approximately doubling in quantity, while both total steel production and freight movement on the railroads had increased less than 50 per cent in the same period.

A remarkable swing has since occurred. Instead of cement holding level with structural steel it declined last year while structural steel had a large increase, the ratio of cement to steel losing about one-fifth.

Of course it did not require statistics of recent years to dispel the fear of some years ago that concrete would become a formidable competitor of structural steel and tend to displace it. Both are construction

materials and they help each other rather than compete. There would be less disposition to erect large bridges and even some buildings if the very convenient concrete were not available for foundations, and there would be less concrete work if there were not something useful to put on top of it.

Cement, moreover, has had the assistance of road building in recent years, involving a large consumption which has no counterpart in fabricated structural steel, for the comparison here being made is solely with fabricated structural steel as reported monthly by the structural fabricating shops to the Department of Commerce. There has been a large increase in road building over 15 or 20 years ago and in addition a reduction in the amount of macadam. Of course no little steel is used in road building, in addition to culvert and water crossing needs.

For the precise comparison the number of barrels of Portland cement per ton of fabricated structural steel is computed in the accompanying table. For fabricated structural steel the figures through 1923 are production of the shops, shipments being given for the later years.

Structural Steel and Cement

	Fabricated Structural Steel, Net Tons	Portland Cement Shipments, Barrels	Barrels Cement to 1 Ton Steel
1913	1,215,000	88,689,377	73.0
1914	1,416,480	86,437,956	61.0
1915	1,987,200	86,891,681	43.7
1916	2,056,320	94,552,296	46.0
1917	1,713,360	90,703,474	52.9
1918	1,733,760	70,915,508	40.9
1919	1,723,680	85,612,899	49.7
1920	1,788,480	96,311,719	53.9
1921	1,188,600	95,507,147	80.4
1922	2,334,720	117,701,216	50.4
1923	2,433,600	135,912,118	55.8
1924	2,669,940	146,047,549	54.7
1925	2,998,080	157,295,212	52.4
1926	3,214,800	162,187,090	50.4
1927	2,853,750	170,922,000	59.9
1928	3,126,200	175,455,000	56.1
1929	3,588,400	169,394,000	47.2

In the last two years there has been a remarkably sharp drop in the ratio of cement to structural steel, while last year there was an absolute drop in cement. From 1905, when cement production was 35,000,000 barrels, to 1922 there was an average annual increase in cement of slightly more than 7 per cent, while from 1922 to 1928 the average was almost 7 per cent. Then for 1929 there was 3 per cent decrease in cement but 15 per cent increase in fabricated structural steel, while the increase in orders was even more, 17 per cent.

Trouble Ahead for Russia

AMERICAN engineers and industrialists who are contemplating entering into relations with the Soviet Government of Russia may well pause to consider the real situation in that country apart from the grandiose plans of the politicians who are attempting to direct affairs, involving the alteration of human nature.

We read in fugitive press dispatches of bread lines in Russian towns, decrees for meatless days, and the imminence of famine conditions. In some intelligent descriptions and analyses that have recently been published we become acquainted with the real reasons.

The simple fact is that, although the imperial government was overthrown and succeeded by a government of communistic doctrinaires, the great mass of Russia and the Russian people have never become communistic except in so far as communism means the reappropriation of property. Immediately following the revolution the townspeople confiscated the public services, the factories, etc., and the country people confiscated and broke up the landed estates, but the latter operation was purely individualistic rather than communistic and when it was completed the peasants, or muzhiks, were satisfied. They had an intense land hunger, but no idea of working altruistically for common welfare.

The breaking up of the large estates was ipso facto impairing of production. Mechanization and management were sacrificed, as has been universally the experience, but that fact may receive economic approval in view of the diffusion of happiness and contentment that follows the spreading of ownership in land. It does not, however, harmonize with projects for national prosperity and the aspirations of town dwellers, who do not own any land, nor want to.

Anyway, starting with this handicap the Soviet Government made things worse for itself by penalizing the more intelligent peasants, who were able to produce a substantial surplus and therefore create savings for themselves; and by practically confiscating the surplus of all peasants. According to communistic theory the agriculturists ought to send wheat into the towns and the factory workers ought to return calico and hardware to the country, but practically things do not work that way.

Rather than surrender his surplus for nothing the muzhik reflects that he might as well have no surplus. So he raises what barely supplies his own needs and does not think of the townsfolk at all. In the meanwhile the townspeople starve. It appears that this is the rock against which the Bolshevist Government is going to split, and from all accounts the breaking asunder is near at hand. The peasants themselves lack the cohesion, sense and leadership to take over the government. The old aristocracy and intelligentsia no longer have any foothold. The split will probably be among the Bolshevists themselves.

Trends in Motor Transport

WHO has not silently or audibly sworn at the lumbering truck which creeps up the hills and holds to the center of the road, and dashes down the grades and across the level with a terrifying pace and roar? Or the wide-gage interurban bus with powerful engine and brakes, which weaves in and out of traffic as though driven by a college boy hastening home on vacation? We all wish that something could be done about it, and the collective and instinctive wish that something should be done about it is being answered by economic influence.

First, there is the fact that Mr. Average Citizen, who is annoyed and endangered on the road, is the man who has paid the taxes that built the roads, and is the man who buys the transportation tendered by the motor lines. A public-be-damned policy did not

prove profitable to the railroads a generation ago, and the newer entries into the traffic tangle will find it increasingly difficult to sell their services or to escape the regulation of public commissions or the imposition of special fees and taxes for the right to operate.

Cut rates have attracted a considerable volume of traffic to motor transport, to the concern of the railroads, but experience indicates that much of it is handled at a loss. Costs of automobile operation, maintenance, depreciation and insurance are very high, as every car owner knows; most "jitney" operators do not realize how high it is until they are forced to buy new equipment, and then they usually fade out of the picture. Experience both here and in England clearly indicates that the field of profitable operation for motors is for short hauls and rapid deliveries; railroads are still supreme for long hauls and comfort. If anyone doubts this, let him take a 150 or 200-mile trip in a motor bus, and return in a Pullman car.

Manufacturers of motor trucks also have rightly appraised the trend of the times. The road-destroying truck with solid wheels, stiff springs and great strength is still being made, but it is used more and more for haulage within industrial areas or on heavy construction work. Trend in modern truck construction is toward a unit of moderate size, with speed comparable to the average passenger car, mounted on balloon tires, with four-wheel brakes (often air operated) and other safety equipment. Such a truck is well adapted for the speedy door-to-door deliveries on trips requiring an hour to a day, and in such service cannot be approached by the railroad in speed or convenience. As such, it is capable of developing much traffic which would never be offered to the railroads, and consequently is economically justifiable and its use is bound to increase.

Speed, convenience and comfort are also the aim of the progressive factors in motor bus transport. Statistics clearly show that the railroads are steadily losing short-haul passenger business other than commutation traffic, but are maintaining their patronage for distances of 100 miles or over, despite the enormous amount of touring in privately owned cars. For the shorter hauls the motor bus fills an economic need, because traffic counts show that buses carry a much larger number of persons than the short-line railroads have lost; they have developed traffic of their own. And in certain regions where traffic is unusually dense, bus operators are enjoying good business at fares even greater than corresponding rail fares, if and when they maintain a service which is comfortable and, above all, frequent. Even the railroads know that Mr. Citizen or his wife will willingly pay a premium for convenience.

Electric Furnace and Alloy Cast Irons for Corrosion Resistance

IN a paper presented to the October Congress of Foundrymen in Paris entitled "The Production of Gray Iron in the Electric Furnace," Dr. E. Valenta of the Skoda Works, Czecho-Slovakia, strongly recommended electric furnace cast iron as having great tensile, compressive and bending strength, and high resistance to impact and fatigue. By proper manipulation it can produce an alloy of great purity with a high resistance to scaling and to wear.

Such cast iron, he said, maintains its good qualities at temperatures up to 450 deg. C. Its commercial importance comes from its great resistance to corrosion, as is natural with an iron which has such a fine grain, and the nearly complete elimination of common impurities such as sulphur and phosphorus. He showed that the smallest amount of corrosion occurred with an iron produced in an electric furnace and containing only 0.005 per cent of sulphur. Even this amount could be produced fairly easily in the electric furnace, he said.

Many founders have illusions on the importance of a moderate amount of silicon, nickel or chromium to resist corrosion, but if the iron is not homogeneous, electrolytic action is bound to occur, with the consequence that better results are often obtained with a common cast iron than with one of complex and expensive composition.

At the same Congress, Dr. Marcel Ballay also discussed this question of corrosion of cast iron in a comprehensive paper. He expressed the opinion that although steels have already been produced which are practically unoxidizable, corrosion of cast iron is still very far from being clearly understood; thus, the rôle of graphite alone has caused much discussion. Steels of high resistance to corrosion are of martensitic or austenitic constitution, and it is natural to seek a cast iron of similar microscopic structure, always bearing in mind that "stainless" steels often contain more than 12 per cent chromium, which amount would make cast iron unworkable.

Nevertheless, austenitic cast iron (alloys with 14 to 15 per cent nickel and 5 to 6 per cent copper) are at present among those which show the greatest resistance to corrosion. They do not conform to all requirements (such as the resistance to a wide variety of strong acids, alkalies, and chemical solutions) but a metal or alloy which does this is not known. Although these cast irons with nickel and copper corrode more rapidly than irons with 13 per cent of silicon, they are more easily machined, are less fragile, and are relatively cheap. The study of these irons is quite recent; probably further investigation will develop even more highly resistant combinations.

A year ago welded tank tops were installed in two Lake steamers during an extensive overhaul, and this winter another pair of vessels is being remodeled in the same way. After the old plating and supporting stringers are cut out, the new tank tops are fabricated and erected in the hold, entirely without preliminary shop work. The patented design (controlled by Channel Steel Hull Corporation) uses 12-in. ship channels, laid flange to flange, and welded heel and toe by the electronic tornado process of automatic carbon arc welding. This process, developed by Lincoln Electric Co., Cleveland, requires no welding rod. Ten channels 48 ft. long welded together form a floor section 10 x 48 ft. in area, which in effect is a ⅝-in. plate stiffened longitudinally by integral ribs on 12-in. centers. These floor sections are then laid over the tops of the supporting frames, flanges down, and welded to the supports and to the adjacent units. Experience with the vessels remodeled a year ago indicates that such a tank top will have a longer life than the conventional design because it is more rigid and there are no rivets to work loose.

Nominations for Foundry Association

The nominating committee of the American Foundrymen's Association has presented the following slate for officers, the committee having met in Cleveland, Jan. 13, for the purpose:

For president, N. K. B. Patch, secretary, Lumen Bearing Co., Buffalo.

For vice-president, E. H. Ballard, general foundry and pattern shop superintendent, General Electric Co., West Lynn, Mass.

For directors, each to serve three years: C. S. Anderson, vice-president and general manager, Belle City Malleable Iron Co., Racine, Wis., H. R. Culling, vice-president, Carondelet Foundry Co., St. Louis, Fred Erb, president, Erb-Joyce Foundry Co., Detroit, R. M. Maull, treasurer, Tabor Mfg. Co., Philadelphia, and D. M. Scott, vice-president, Gould Coupler Co., Depew, N. Y., and the Symington Co., Rochester, N. Y.

Republic May Acquire Gulf States Steel Property

BIRMINGHAM, Feb. 10.—A visit today to the Alabama City works of the Gulf States Steel Co. of a number of officials of the Republic Steel interests gives color to rumors, as yet unconfirmed, that the Gulf State properties are likely to be joined with the Birmingham plants of the Republic Iron & Steel Co., as a unit of the Republic Steel Corporation.

Youngstown Situation Called Favorable

YOUNGSTOWN, Feb. 10.—Immediate outlook of the steel industry is bright, says James A. Campbell, chairman of the Youngstown Sheet & Tube Co., and indications are that the industry will not only be able to maintain the present rate of operations, averaging 75 per cent, but will improve on this rate. The steel business is good at present, he states, adding that railroad buying of new equipment is an important factor in stimulating new steel purchases, and that the opening of the building season will release substantial tonnages of structural shapes. Work starts at once on the company's new $10,000,000 continuous sheet mills, which will have a monthly capacity of 40,000 tons. This plant will be capable of much development in various finishing processes.

Hyatt & Co., 926 Race Street, Philadelphia, began business Feb. 1, carrying a stock of black, galvanized and copper sheets, tin plate and other roofing materials. Officers of the company are Nathaniel Hyatt, president, George F. Kessler, treasurer, and Ralph S. Arrison, secretary. Associated with the company also are E. Mullen. Henry Homan and Paul Fleming. All were formerly with Gummy MacFarland & Co., Philadelphia.

The Week in Business

Drift of Current Financial and Economic Opinion

FORECASTERS still remain cautious about committing themselves on business in 1930. The outlook to many of them seems obscure even at this date. If anything, there is a lengthening to several months of the return to normal period.

The center of attention for the time being is the money market. The reductions abroad and in this country of the central bank discount rate are hailed as highly favorable to business. The Harvard Economic Society believes the easing situation should help stabilization of prices of those commodities that are important in international trade and that there will be further stimulus to new bond issues and hence to construction.

A strong statement is likewise made by Alexander Dana Noyes, in the New York *Times*, who observes that neither here nor in any other country will the money market and the general credit situation throw obstacles in the way of reviving trade.

One notable exception among these comments is that of the *Financial Chronicle*, which sees no warrant for rate reduction here just because of the action of the Bank of England. "It can have the effect only of either starting another outflow of gold or else starting another speculative craze on the stock market."

Normal in business will be reached in the next four months, according to the La Salle Extension University. Among its reasons are the restored traditional legal reserve of gold in England. Further, it expects continued liquidation of bank collateral loans here following a modest but definite rise in stock market prices. It intimates that investors will soon become convinced of the security of earnings of American industry without waiting for the statistical proof.

Purchasing Power Unimpaired

Purchasing power for things in general was little impaired by the break in stocks, in the opinion of James A. Garfield, in the New York *Herald Tribune*. He bases his contentions on the findings of the National Bureau of Economic Research. Over 44,000,000 incomes in 1926, representing 99 per cent of the total number of incomes for the year, were under $8,700 and averaged just under $1,700. This average is only 19½ per cent, or one-fifth, of the maximum of the class. Therefore, if we take $1,000 as the annual income for each four out of five, the fifth cannot exceed $4,500. If we take $1,500 for each of four, the fifth cannot exceed $2,500. And he suggests that this situation describes 93 per cent of the incomes considered. He concludes that "It is not reasonable to assume that the total number of instances of losses due to security holding by individuals whose incomes did not exceed $2,500 reached any such proportions as many have come to believe."

Expansion in building work may not be so rapid as earlier seemed likely, considering views of economist commentators. The Alexander Hamilton Institute does not look for the first half in building to show any particular improvement over the first half of 1929. "Spending is on a smaller scale than a year ago, due not only to an actual reduction in income, but also to voluntary economizing because of apprehension in regard to the future."

Again the Long Look Ahead

As bearing on the oft-repeated injunction not to sell the United States short, may be quoted remarks made by Odgen L. Mills, Under-Secretary of the Treasury, at a luncheon tendered to him in New York by Gen. Charles H. Sherrill. "Our recent prosperity is to be accounted for largely, if we are going to generalize, to a resourceful and industrious population, vigorous and able leadership, rich natural resources, sound administration of governmental affairs, and friendly and constructive international relations. In view of the strength of these basic factors in this country and of the steady improvement in political and economic conditions throughout the world, a long-term view of the future is distinctly encouraging."

Iron and Steel Markets

Chicago Output at 90 Per Cent

Latest Expansion in Steel Demand Localized, But Total Production Makes Slight Gain—Structural Awards Large—Scrap Higher

STEEL demand, after rebounding sharply in January, is not only holding its own, but, in the aggregate, has shown a further slight gain. The most recent expansion of business, however, has not been shared in by all producers. Whereas steel ingot output at Chicago has risen to 90 per cent of capacity, at Pittsburgh it remains at 75 per cent and in the Youngstown district has declined a few points. The average for the country at large has advanced to 79 per cent compared with nearly 77 per cent a week ago.

Rail releases help account for the high rate of production in the Chicago district. One Lake Michigan rail mill is now running full and the other will reach capacity operations by the end of the month. Bookings in other products are also large, with deliveries on plates, shapes and bars now ranging from four to six weeks. Last month's specifications for soft steel bars at Chicago were 16 per cent larger than in January, 1929.

The outlook in heavier rolled products is generally favorable, thanks to railroad equipment purchases and structural steel awards. The Van Sweringen lines have placed 13,500 freight cars in the last fortnight and may soon purchase 2500 additional. Fabricated steel lettings were in heavy volume for the third week, totaling 52,000 tons, compared with 52,500 tons last week and 53,000 tons two weeks ago. Electrification work for the Pennsylvania Railroad, 12,000 tons, and a New York subway section, 6800 tons, were conspicuous among the current contracts.

Chicago mills look for the early release of 100,000 tons of plates for a gas line pipe contract placed last fall. Among prospective pipe projects is a 500-mile line to be built in northwestern Texas by the South Plains Pipe Line Co., a subsidiary of the Prairie Oil & Gas Co. Chicago reports the award of 2000 tons of plates for oil storage tanks, with 20,000 tons of such work in sight. Shipbuilders are figuring on four tankers, requiring 8000 tons of plates, for Pacific Coast oil companies.

Demand for automobile steel, although still gaining, is not well diversified. A Cleveland bar mill is operating at 100 per cent. Similarly, a number of sheet and strip mills are running well, with schedules arranged for two weeks or more, but other makers of flat-rolled products continue on a day-to-day basis. January production of motor cars totaled 300,000 units, compared with slightly more than 400,000 in the first month of 1929. While the Ford and Chevrolet companies promise to show a material increase in output this month, makers of medium and high-priced cars will probably do little better than maintain their January rates.

The bulk of the steel being bought is for prompt requirements. The caution that still dominates the policy of buyers is reflected in the hesitancy of container manufacturers in releasing orders against tin plate contracts. Tin mills, however, are keeping their schedules well adjusted to actual demand, with present operations at 75 per cent.

The gain of 51,517 tons in the unfilled orders of the United States Steel Corporation in January brought the total to 4,468,710 tons, compared with 4,109,487 tons one year previous and 4,275,947 tons two years ago. Total bookings, however, are less significant than the rate of specifying. Production in both January, 1929, and January, 1928, was larger than last month.

January production of steel ingots for the entire industry was 3,786,319 tons, or 140,234 tons a day. The daily rate, although 21 per cent greater than in December, was the smallest for any initial month since 1924.

Irregularities in steel prices have not disappeared, but the trend is toward a steadier market. A number of leading sheet mills have announced that they will not accept orders at less than 2.65c., Pittsburgh, for black sheets, 3.30c. for galvanized and 2.10c. for blue annealed light plates. An expansion in demand for metal furniture sheets has brought out concessions of $2 a ton to 3.90c. a lb., Pittsburgh.

Scrap markets, although still rather apathetic, are slightly stronger. Heavy melting grade has advanced 25c. a ton at Pittsburgh, Chicago, Cleveland and Cincinnati, and 50c. at Buffalo.

Pig iron demand is spotty, with some melters still buying from hand to mouth and others using up tonnage still due on contracts. Shipments, however, show an upward tendency, particularly to automotive foundries. The price situation is tenser in districts where Alabama iron is competitive. In the New York district Buffalo foundry iron has broken 50c. a ton to $16, furnace.

Domestic and foreign producers of ferromanganese have adopted quantity differentials. The new schedule ranges from $94 a ton, seaboard, for 2000 tons or more to about $118 a ton, f.o.b. furnace, for lots of 500 to 999 lb. packed in barrels.

THE IRON AGE composite for pig iron has declined from $18.17 to $18 a ton, the lowest figure since October, 1928. Finished steel is unchanged at 2.305c. a lb.

A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous, Advances Over Past Week in Heavy Type, Declines in Italics

	Feb. 10, 1930	Feb. 4, 1930	Jan. 14, 1930	Feb. 11, 1929
Pig Iron, Per Gross Ton:				
No. 2 fdy., Philadelphia	$20.76	$20.76	$20.76	$21.26
No. 2, Valley furnace	18.50	18.50	18.50	17.50
No. 2 Southern, Cin'ti	*17.19*	17.69	17.69	20.19
No. 2, Birmingham	14.50	14.50	14.50	16.50
No. 2 foundry, Chicago*	20.00	20.00	20.00	20.00
Basic, del'd eastern Pa.	19.50	19.50	19.50	19.75
Basic, Valley furnace	18.50	18.50	18.50	17.50
Valley Bessemer, del'd P'gh.	20.76	20.76	20.76	20.01
Malleable, Chicago*	20.00	20.00	20.00	20.00
Malleable, Valley	19.00	19.00	19.00	18.00
Gray forge, Pittsburgh	....	....	....	....
L. S. charcoal, Chicago	27.04	27.04	27.04	27.04
Ferromanganese, furnace	*94.00*	100.00	100.00	105.00
Rails, Billets, Etc., Per Gross Ton:				
Rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	36.00	36.00	36.00	36.00
Rerolling billets, Pittsburgh	33.00	33.00	34.00	33.00
Sheet bars, Pittsburgh	33.00	33.00	34.00	34.00
Slabs, Pittsburgh	33.00	33.00	34.00	33.00
Forging billets, Pittsburgh	38.00	38.00	39.00	38.00
Wire rods, Pittsburgh	40.00	40.00	40.00	42.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.85	1.85	1.85	1.90
Finished Steel, *Per Lb. to Large Buyers:*	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.85	1.85	1.90	1.90
Bars, Chicago	1.95	1.95	2.00	2.00
Bars, Cleveland	1.85	1.85	1.85	1.90
Bars, New York	2.19	2.19	2.24	2.24
Tank plates, Pittsburgh	1.80	1.80	1.80	1.90
Tank plates, Chicago	1.95	1.95	2.00	2.00
Tank plates, New York	2.07½	2.07½	2.07½	2.17½
Structural shapes, Pittsburgh	1.80	1.80	1.80	1.90
Structural shapes, Chicago	1.95	1.95	2.00	2.00
Structural shapes, New York	2.04½	2.04½	2.09½	2.14½
Cold-finished bars, Pittsburgh	2.10	2.10	2.20	2.20
Hot-rolled strips, Pittsburgh	1.80	1.80	1.80	1.80
Cold-rolled strips, Pittsburgh	2.65	2.65	2.65	2.85

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

	Feb. 10, 1930	Feb. 4, 1930	Jan. 14, 1930	Feb. 11, 1929
Finished Steel, *Per Lb. to Large Buyers:*	Cents	Cents	Cents	Cents
Sheets, black, No. 24, P'gh	2.60	2.60	2.65	2.85
Sheets, black, No. 24, Chicago dist. mill	2.75	2.75	2.85	2.95
Sheets, galv., No. 24, P'gh	3.30	3.30	3.30	3.60
Sheets, galv., No. 24, Chicago dist. mill	3.40	3.40	3.50	3.70
Sheets, blue, No. 13, P'gh	2.25	2.25	2.25	2.20
Sheets, blue, No. 13, Chicago dist. mill	2.35	2.35	2.45	2.30
Wire nails, Pittsburgh	2.25	2.25	2.30	2.65
Wire nails, Chicago dist. mill	2.35	2.35	2.35	2.70
Plain wire, Pittsburgh	2.40	2.40	2.40	2.50
Plain wire, Chicago dist. mill	2.45	2.45	2.45	2.55
Barbed wire, galv., P'gh	2.95	2.95	2.95	3.30
Barbed wire, galv., Chicago dist. mill	3.00	3.00	3.00	3.35
Tin plate, 100 lb. box, P'gh	$5.25	$5.25	$5.25	$5.35
Old Material, Per Gross Ton:				
Heavy melting steel, P'gh	$17.00	$16.75	$16.75	$18.75
Heavy melting steel, Phila.	14.50	14.50	14.50	16.50
Heavy melting steel, Ch'go	13.25	13.00	12.75	16.00
Carwheels, Chicago	14.50	14.25	13.75	14.50
Carwheels, Philadelphia	15.00	15.00	15.00	16.50
No. 1 cast, Pittsburgh	14.50	14.50	14.50	15.00
No. 1 cast, Philadelphia	15.00	15.00	15.00	16.50
No. 1 cast, Ch'go (net ton)	13.50	13.50	13.50	16.50
No. 1 RR. wrot., Phila.	15.00	15.00	15.00	16.00
No. 1 RR. wrot., Ch'go (net)	12.00	12.00	12.00	14.50
Coke, Connellsville,				
Furnace coke, prompt	$2.60	$2.60	$2.60	$2.85
Foundry coke, prompt	3.50	3.50	3.50	3.75
Per Net Ton at Oven:				
Metals, *Per Lb. to Large Buyers:*	Cents	Cents	Cents	Cents
Lake copper, New York	18.12½	18.12½	18.12½	18.12½
Electrolytic copper, refinery	17.75	17.75	17.75	17.75
Tin (Straits), New York	*38.87½*	39.12½	38.75	49.75
Zinc, East St. Louis	*5.20*	5.25	5.20	6.35
Zinc, New York	*5.55*	5.60	5.55	6.70
Lead, St. Louis	6.10	6.10	6.10	6.62½
Lead, New York	6.25	6.25	6.25	6.85
Antimony (Asiatic), N. Y.	8.75	8.75	8.50	9.62½

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Pittsburgh

Steady Demand at About Last Week's Rate Features Most Steel Products, But Not All Makers Fare Alike

PITTSBURGH, Feb. 10.—While the average steel ingot operating rate in the immediate Pittsburgh district is about the same this week as it was last, a slight curtailment is reported from the Valleys. On the other hand, the schedules of finishing mills are somewhat higher at some points, and the industry seems to be readjusting itself to a steadier, if less spectacular, demand for steel products than characterized it during January.

On some products, particularly those going in heavy tonnages to the automobile industry, demand is not well diversified. While a few sheet and strip mills are now scheduled for two weeks or more, others are running on the day-to-day basis which has prevailed for the last three months. Specifications for the heavy hot-rolled products are still improving, but not so rapidly as they did in January. Railroad car builders served by Pittsburgh mills shared satisfactorily in the recent orders of the Chesapeake & Ohio and affiliated roads, and nearby shops may be counted on to require a steady tonnage of plates for three or four months.

The larger structural shops in the district are well engaged, but smaller units lack backlogs. However, structural shape tonnage on mill books is still piling up, and the heavy construction industries promise to be as heavy consumers of steel this year as they were last. Farm implement makers are also proving to be steady users of bars and sheets.

Container manufacturers have been rather hesitant in releasing their specifications, but tin plate companies are keeping their mill schedules well adjusted to actual demand, and will be ready to increase operations sharply as the crop prospects are determined and can orders are placed. One tin plate maker has recently benefited by a large export order.

Prices seem to be gaining additional strength as demand improves. Makers of sheets have announced minimum quotations of 2.65c., Pittsburgh, on black, 3.30c. on galvanized and 2.10c. on blue annealed. Although lower quotations have never been officially recognized by leading makers, sales at concessions of $1 to $2 a ton have not been infrequent in the Eastern territory and at Detroit. The general market on bars is now fairly well established at 1.85c., Pittsburgh, while plates and shapes are quotable at this figure on anything except very large lots. Weakness persists in the nail market and the $2.30 price to large jobbers is now being extended to the trade. A similar situation exists with respect to other merchant wire products, and large jobbers are able to get $2.25 on nails.

As the second half of the quarter begins, talk of higher prices is heard on various steel products, but any advances will depend entirely upon demand over the next month. Inactivity continues in the pig iron market, although shipments are gradually improving and sellers are receiving a fair tonnage in small orders. Scrap is less active, but recent railroad lists have

developed higher prices for heavy melting steel.

Pig Iron.—Sellers in this district report the usual small-lot sales of foundry, malleable and basic iron, which have constituted the greater part of the tonnage placed since the first of the year. Sales of basic iron are negligible, although one or two small purchases in the immediate Valley district brought the full price of $18.50, furnace. Foundry iron is bringing the same price, while malleable and Bessemer are quoted at $19. The market is still devoid of large inquiries, although many of the more important consumers are no longer covered by contract and are buying from hand to mouth. The National Radiator Corporation, which recently bought a small tonnage of iron for its Newcastle, Pa., plant, is again in the market for 200 tons of foundry iron. The Pressed Steel Car Co., McKees Rocks, Pa., also, has placed small tonnages recently, but like other consumers is restricting its purchases. Shipments are keeping up, and some of the Valley makers are eating into their stock piles to fill current tonnage releases.

Prices per gross ton, f.o.b. Valley furnace:

Basic	$18.50
Bessemer	19.00
Gray forge	18.00
No. 2 foundry	18.50
No. 3 foundry	18.00
Malleable	19.00
Low phos., copper free	27.00

Freight rate to Pittsburgh or Cleveland district, $1.76.

Prices per gross ton, f.o.b. Pittsburgh district furnace:

Basic	$19.00
No. 2 foundry	19.00
No. 3 foundry	18.50
Malleable	19.50

Freight rates to points in Pittsburgh district range from 63c. to $1.13.

Semi-Finished Steel.—The market is quiet at recently announced price levels, but from the standpoint of actual buying the $33, Pittsburgh, price on billets, slabs and sheet bars is still a nominal quotation. However, shipments of semi-finished steel to large contract users are keeping up steadily, and many contracts have doubtless been renewed at appropriate quotations. Mills have rather large stocks of crude steel on hand, and some of them are considering the accumulation of additional surplus to accommodate the period of possible peak demand in the late spring months. Wire rods are still quoted at $40, Pittsburgh or Cleveland, by the principal producers, and, although concessions are reported in some territories, there seems to be nothing to indicate an open break in the market. Users of wire rods are taking comparatively large shipments, and occasional open market sales are commanding the full price.

Bars, Shapes and Plates.—Although demand for the heavy hot-rolled products is still rather spotty, mills are being called upon regularly to quote on large tonnages of plates and shapes, and aggregate business in bars is fairly satisfactory. Pittsburgh mills will benefit materially from the recent car orders of the Chesapeake & Ohio and affiliated railroads, as fully half of these cars will be built in shops served by Pittsburgh steel companies. Although these shops are considerably better supplied with orders than usual, none of them have anything like capacity operating schedules in prospect, but will maintain a fairly steady rate of operations over the next three or four months. The inquiry for 1800 freight cars made recently by the Louisville & Nashville is still open. Structural mills in the Pittsburgh territory are running at a good rate, and are well supplied with large backlog tonnage. The larger fabricating shops are also well engaged, although some of the smaller companies are in need of business, as is indicated by exceptionally low bids on recent large contracts. The reinforcing bar business is beginning to improve seasonably, although activity is confined to pending work rather than to the actual placing of orders. Users of merchant bars are still buying rather cautiously, but activity in Detroit is greater. Prices have gained some stability. The bar market is quotable at 1.85c. to 1.90c., Pittsburgh, with deviations exceptional. Plates and shapes are holding at 1.85c., although prices one to many dollars a ton lower have appeared on very large shape tonnages.

Rails and Track Supplies.—This line is now rather quiet, as most of the railroads have contracted for their spring requirements, and are steadily ordering out the tonnage. The Nickel Plate has not yet placed its track accessories, but action is expected on this business in the near future. Specifications are normally good for this time of the year, and, while somewhat under January as might be expected, are satisfactory to most makers. Prices are holding in the majority of cases.

Tubular Goods.—Small inquiries for line pipe constitute the bulk of the business in this market, as oil country demand for seamless goods is light, and it is yet too early to expect any marked improvement in standard pipe. Mechanical tubing and boiler tubes are maintaining the January increases in tonnage, and a fair amount of business in the former is expected to develop in a short time from the airplane industry. Pipe mill operations in the Pittsburgh district are averaging 50 to 60 per cent of capacity. Prices are said to be satisfactory.

Wire Products.—Large jobbers in this district report a $2.25, Pittsburgh, price on wire nails, although leading manufacturers doubt that this figure is at all general. It is conceded, however, that $2.30, Pittsburgh, is the top of the market on nails, even though small-lot business is restricted. Other merchant wire products are also very quiet, with prices not clearly defined. On manufacturers' wire the price continues to be 2.40c., Pittsburgh, and consumers are not averse to paying the full price, especially when difficult specifications are involved.

Tin Plate.—Tin mill operations are just holding their own, as producers are reluctant to turn out material too far in advance of the actual needs of consumers, and it will be several weeks before the demands of the container manufacturers begin to reach their peak. The average operating rate in this district is about 75 per cent of capacity. The $5.25, Pittsburgh, price now appears to be well established.

THE IRON AGE Composite Prices

Finished Steel

Feb. 10, 1930, 2.305c. a Lb.

One week ago	2.305c.
One month ago	2.319c.
One year ago	2.391c.

Based on steel bars, beams, tank plates, wire, rails, black pipe and black sheets. These products make 87 per cent of the United States output of finished steel.

	High	Low
1929	2.412c., April 2;	2.362c., Oct. 29
1928	2.391c., Dec. 11;	2.314c., Jan. 3
1927	2.453c., Jan. 4;	2.293c., Oct. 25
1926	2.453c., Jan. 5;	2.403c., May 18
1925	2.560c., Jan. 6;	2.396c., Aug. 18

Pig Iron

Feb. 10, 1930, $18.00 a Gross Ton

One week ago	$18.17
One month ago	18.21
One year ago	18.38

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

	High	Low
1929	$18.71, May 14;	$18.21, Dec. 17
1928	18.59, Nov. 27;	17.04, July 24
1927	19.71, Jan. 4;	17.54, Nov. 1
1926	21.54, Jan. 5;	19.46, July 13
1925	22.50, Jan. 13;	18.96, July 7

Mill Prices of Finished Iron and Steel Products

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.85c. to 1.90c.
F.o.b. Chicago	1.95c. to 2.00c.
Del'd Philadelphia	2.17c. to 2.22c.
Del'd New York	2.19c. to 2.24c.
Del'd Cleveland	1.85c.
F.o.b. Cleveland	1.85c.
F.o.b. Lackawanna	2.00c.
F.o.b. Birmingham	2.00c.
C.i.f. Pacific ports	2.35c.
F.o.b. San Francisco mills	2.35c.

Billet Steel Reinforcing

F.o.b. Pittsburgh mills, 40, 50, 60-ft.	1.95c.
F.o.b. Pittsburgh mills, cut lengths	2.20c.
F.o.b. Birmingham, mill lengths	2.00c.

Rail Steel

F.o.b. mills, east of Chicago dist.	1.80c. to 1.90c.
F.o.b. Chicago Heights mill	1.85c.
Del'd Philadelphia	2.12c. to 2.22c.

Iron

Common iron, f.o.b. Chicago	1.95c. to 2.00c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.12c.
Common iron, del'd New York	2.14c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.80c. to 1.90c.
F.o.b. Chicago	1.95c. to 2.00c.
F.o.b. Birmingham	2.00c.
Del'd Cleveland	1.99c. to 2.04c.
Del'd Philadelphia	2.00c. to 2.05c.
F.o.b. Coatesville	1.90c. to 1.95c.
F.o.b. Sparrows Point	1.90c. to 1.95c.
F.o.b. Lackawanna	1.90c. to 1.95c.
Del'd New York	2.07½c. to 2.12½c.
C.i.f. Pacific ports	2.25c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.80c. to 1.90c.
F.o.b. Chicago	1.95c. to 2.00c.
F.o.b. Birmingham	2.00c.
F.o.b. Lackawanna	1.90c. to 1.95c.
F.o.b. Bethlehem	1.90c. to 1.95c.
Del'd Cleveland	2.04c.
Del'd Philadelphia	1.86c. to 2.01c.
Del'd New York	2.04½c. to 2.09½c.
C.i.f. Pacific Ports	2.35c.

Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, P'gh	1.90c.
Wider than 6 in., P'gh	1.80c.
6 in. and narrower, Chicago	2.10c.
Wider than 6 in., Chicago	2.00c.
Cooperage stock, P'gh	2.20c.
Cooperage stock, Chicago	2.30c.

Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.10c.
Bars, f.o.b. Chicago	2.10c.
Bars, Cleveland	2.10c.
Bars, Buffalo	2.10c.
Shafting, ground, f.o.b. mill	*2.45c. to 3.40c.
Strips, P'gh	2.65c. to 2.75c.
Strips, Cleveland	2.65c. to 2.75c.
Strips, del'd Chicago	2.95c.
Strips, Worcester	2.80c. to 2.90c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	4.00c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Merchant Trade

	Base per Keg
Standard wire nails	$2.25 to $2.30
Cement coated nails	2.30
Galvanized nails	4.30

	Base per Lb.
Polished staples	2.75c.
Galvanized staples	3.00c.
Barbed wire, galvanized	2.95c.
Annealed fence wire	2.45c.
Galvanized wire, No. 9	2.90c.
Woven wire fence (per net ton to retailers)	$65.00

To Manufacturing Trade

Bright hard wire, Nos. 6 to 9 gage	2.40c.
Spring wire	3.50c.

(Carload lots, f.o.b. Chicago)

Wire nails	$2.35 to $2.45 (keg)
Annealed fence wire	2.50c. to 2.60c. (lb.)
Bright hard wire to manufacturing trade	2.45c.

Anderson, Ind., mill prices are ordinarily $1 a ton over Pittsburgh base; Duluth, Minn., mill $2 a ton over Pittsburgh, and Birmingham mill $3 a ton over Pittsburgh.

Cut Nails

	Per 100 Lb.
Carloads, Wheeling, Reading or Northumberland, Pa	$2.70
Less carloads, Wheeling or Reading	2.80

Light Plates

No. 10, blue annealed, f.o.b. P'gh	2.00c. to 2.10c.
No. 10, blue annealed, f.o.b. Chicago dist.	2.20c.
No. 10, blue annealed, del'd Phila.	2.42c.
No. 10, blue annealed, B'ham	2.25c.

Sheets

Blue Annealed

	Base per Lb.
No. 13, f.o.b. P'gh	2.15c. to 2.25c.
No. 13, f.o.b. Chicago dist.	2.35c.
No. 13, del'd Philadelphia	2.57c.
No. 13, blue annealed, B'ham	2.50c.

Continuous Mill Sheets

No. 10 gage, f.o.b. P'gh	1.90c. to 2.00c.
No. 13 gage, f.o.b. P'gh	2.00c. to 2.15c.

(Usual range 24 in. to 48 in. wide)

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh	2.60c. to 2.65c.
No. 24, f.o.b. Chicago dist. mill	2.75c. to 2.85c.
No. 24, del'd Philadelphia	2.92c. to 3.07c.
No. 24, f.o.b. Birmingham	2.90c.

Metal Furniture Sheets

No. 24, f.o.b. P'gh	3.90c. to 4.00c.

Galvanized

No. 24, f.o.b. Pittsburgh	3.30c. to 3.40c.
No. 24, f.o.b. Chicago dist. mill	3.40c. to 3.50c.
No. 24, del'd Cleveland	3.49c. to 3.59c.
No. 24, del'd Philadelphia	3.62c. to 3.72c.
No. 24, f.o.b. Birmingham	3.45c. to 3.50c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.90c. to 3.00c.
No. 28, f.o.b. Chicago dist. mill	3.00c. to 3.10c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	3.90c.

Long Ternes

No. 24, 8-lb. coating, f.o.b. mill	3.90c. to 4.00c.

Vitreous Enameling Stock

No. 24, f.o.b. Pittsburgh	3.90c.

Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mills	$5.25
Standard cokes, f.o.b. Gary	5.35

Terne Plate

(*F.o.b. Morgantown or Pittsburgh*)

(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$10.70
15-lb. coating I.C.	13.40
20-lb. coating I.C.	14.60
25-lb. coating I.C.	$15.90
30-lb. coating I.C.	16.80
40-lb. coating I.C.	18.80

Alloy Steel Bars

(F.o.b. makers' mill)

Alloy Quantity Bar Base, 2.65c. per Lb.

S.A.E. Series Numbers		Alloy Differential
2000	(½% Nickel)	$0.25
2100	(1½% Nickel)	0.55
2300	(3½% Nickel)	1.50
2500	(5% Nickel	2.25
3100	Nickel Chromium	0.55
3200	Nickel Chromium	1.35
3300	Nickel Chromium	3.80
3400	Nickel Chromium	3.20
4100	Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100	Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600	Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel)	1.05
5100	Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100	Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100	Chromium Spring Steel	0.20
6100	Chromium Vanadium Bars	1.20
6100	Chromium Vanadium Spring Steel	0.95
9250	Silicon Manganese Spring Steel (flats)	0.25
	Rounds and squares	0.50
	Chromium Nickel Vanadium	1.50
	Carbon Vanadium	0.95

Above prices are for hot rolled steel bars, forging quality. The differential for cold-drawn bars is ¾c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a sectional area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

Rails

	Per Gross Ton
Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	36.00
Light (from rail steel), f.o.b. mill	34.00
Light (from billets), f.o.b. Ch'go mill	36.00

Track Equipment

	Base per 100 Lb
Spikes, ⅜ in. and larger	$2.80
Spikes, ½ in. and smaller	2.80
Spikes, boat and barge	3.00
Tie plate, steel	2.07½
Angle bars	$2.75
Track bolts, to steam railroads	$3.80 to 4.00
Track bolts, to jobbers, all sizes, per 100 count	70 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛	45	19½	¼ and ⅜	+11	+36
¼ to ⅜	51	25½	½	23	5
½	56	42½	¾	28	11
¾	60	48½	1 and 1¼	31	15
1 to 3	62	50½	1½ and 2	35	18

Lap Weld

2	55	43½	2	23	9
2½ to 6	59	47½	2½ to 3½	28	13
7 and 8	56	43½	4 to 6	30	17
9 and 10	54	42½	7 and 8	29	16
11 and 12	53	40½	9 to 12	26	11

Butt Weld, extra strong, plain ends

⅛	41	24½	2 to 3	61	50½
¼ to ⅜	47	30½	¼ and ⅜	+13	+48
½	53	42½	½	23	7
¾	58	47½	¾	28	12
1 to 1½	60	49½	1 to 2	34	18

Lap Weld, extra strong, plain ends

2	53	42½	½	29	13
2½ to 4	57	46½	2½ to 4	34	20
4½ to 6	56	45½	4½ to 6	33	19
7 to 8	52	39½	7 and 8	31	17
9 and 10	45	32½	9 to 12	21	8
11 and 12	44	31½			

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discount of 5%, and on galvanized by 1½ points, with supplementary discount of 5%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	38	1½ in.	1
2½ in.—2¾ in.	46	1¾ in.	8
3 in.	52	2 in.—2¼ in.	13
3¼ in.—3¾ in.	54	2½ in.—2¾ in.	16
4 in.	57	3 in.	17
4½ in. to 6 in.	46	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn

1 in.	61	3 in.	46
1¼ to 1½ in.	53	3¼ to 3½ in.	48
1¾ in.	37	4 in.	51
2 to 2¼ in.	32	4½, 5 and 6 in.	40
2½ to 2¾ in.	40		

Hot Rolled

2 and 2¼ in.	38	3¼ to 3½ in.	54
2½ and 2¾ in.	46	4 in.	57
3 in.	52	4½, 5 and 6 in.	46

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gage take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30%, base (carloads)	55
Carbon, 0.30% to 0.40% base	50

Plus differentials for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

Ferroalloys.—Sellers of ferromanganese in this district have adopted the new price schedule on this product, which allows differentials according to tonnage. This plan makes the price to users taking less than 500 tons annually, $99, seaboard or furnace; for those taking 500 to 1000 tons, $98; for those taking 1000 to 2000 tons, $97, and for those using more than 2000 tons annually, $94. These prices are retroactive to Jan. 1, 1930. Shipment of both ferromanganese and spiegeleisen are improving steadily, and spot sales of the latter products are bringing $34, Hazard, Pa.

Bolts, Nuts and Rivets.—Bolt and nut makers have improved their operations since the beginning of the year, and the industry is now operating at 60 to 65 per cent of capacity. Demand for rivets from the railroad car builders is active; steel fabricating companies also are steady users. Warehouse stocks are ample and shipments to this channel are limited. Prices have withstood pressure fairly well, although the automobile industry is able to secure the usual concessions. Bolts are quoted at 70 per cent off list with small rivets at 70 and 10, while large rivets are unchanged at $3.10 a 100 lb., Pittsburgh or Cleveland.

Warehouse Business.—Steel movement out of warehouse in this district is generally satisfactory, although somewhat behind the corresponding period last year. Prices on bars, sheets, wire products are none too strong, but plates and structurals are now holding fairly well at 3c. and reinforcing bars at 2.75c. Cold-finished steel is unchanged and quantity differentials are being adhered to more generally.

Sheets.—Improvements in sheet specifications are not evenly distributed this month. Companies serving the two largest makers of automobiles in the low-priced field are rather well occupied, while others are hardly enjoying as heavy a rate of specifications as they did late in January. However, aggregate tonnage releases are fully up to the January average, and possibly slightly heavier on full-finished material. The industry is operating at approximately 75 per cent of capacity, although the mills of the leading interest are hardly scheduled this high. Price developments during the week have been on the side of added strength, and a number of large producers have now named 2.65c., Pittsburgh, on black, 3.30c. on galvanized, and 2.10c. on No. 10 blue annealed plates, as their absolute minimum quotations. Sales of galvanized sheets to jobbers at less than 3.30c. are said to be confined entirely to one or two places on the Atlantic Seaboard and the South. On the other hand, Detroit buyers of black sheets still claim that concessions of $1 to $2 a ton from the 2.65c. price may be had on large lots. Automobile body sheets are holding fairly well at 3.90c., Pittsburgh, and metal furniture material, which is quoted at 4c., is said to have been sold at 3.90c. in a few instances. If demand becomes more generally distributed within the next month, there is a possibility that higher quotations will be named for second quarter.

Strip Steel.—Specifications for hot-rolled strip steel have continued to increase this month, and tonnage releases thus far in February are considerably ahead of the preceding month with most companies. Most of this increase is coming from the automobile manufacturers, although other consuming lines are maintaining a steady demand. As a result, hot-rolled strip mills are running at 60 to 70 per cent of capacity this week. Most of the material being ordered is for immediate shipment, but consumers are showing more inclination to contract for future needs. The price is fairly well established at 1.80c., Pittsburgh, for material wider than 6 in. and 1.90c. for the narrower sizes. Demand for cold-rolled strip is still dull and mill operations are not above 40 per cent. The price is 2.65c., Pittsburgh, with small tonnages bringing 2.75c.

Cold-Finished Steel Bars.—Steady demand from farm implement makers, coupled with increasing requirements of automobile and automotive parts manufacturers, is gradually improving the cold-finished business, although shipments are by no means as large as they were in the corresponding period of 1929. The price is now well established at 2.10c., Pittsburgh, for bars, and 2.45c. to 3.40c. for shafting.

Coke.—The market on furnace coke is gaining strength at $2.60, Connellsville, and, with surplus stocks no longer an important price factor, prospects are more satisfactory. Although blast furnace activity is higher, steel companies will not be forced to come into the market for supplementary tonnage for some time. Heating coke is in good demand, but the foundry grade is still dull, with shipments increasing very slowly. The coal market presents conflicting tendencies, with demand comparatively good and prices still rather weak.

Old Material.—The scrap market has displayed mixed trends in the last week. The railroad lists brought the expected high prices, the Pennsylvania steel having gone to two points in the district at around $17.50 delivered. Another small sale by a dealer to a smaller consumer brought the same figure, and if this grade of steel is to be taken into consideration when quoting the price on No. 1 heavy melting, the range this week is undoubtedly $16.50 to $17.50. On the other hand, it is equally certain that no mill would pay more than $17 for ordinary No. 1 heavy melting, and the last previous sale of this grade was at only $16.50. In view of this, the market would be best shown by a quotation of $16.50 to $17 on No. 1 heavy melting steel, and $17 to $17.50 on railroad heavy melting. On hydraulic compressed sheets there has been little change. No sales are reported, but offerings are still made at $16.50, and the market is still quotable at $16.25 to $16.50. Specialties are strong, with sales during the week at $21, but the blast furnace grades are lower.

Warehouse Prices, f.o.b. Pittsburgh

	Base per Lb.
Plates	2.90c.
Structural shapes	2.90c.
Soft steel bars and small shapes	2.80c. to 2.90c.
Reinforcing steel bars	2.75c.
Cold-finished and screw stock—	
Rounds and hexagons	3.60c.
Squares and flats	4.10c.
Bands	3.25c.
Hoops	4.25c.
Black sheets (No. 24), 25 or more bundles	3.60c.
Galv. sheets (No. 24), 25 or more bundles	4.25c.
Light plates, blue annealed (No. 10), 1 to 24 plates	3.25c.
Blue annealed sheets (No. 13), 1 to 24 sheets	3.40c.
Galv. corrug. sheets (No. 28), per square	4.13c.
Spikes, large	3.40c.
Small	3.80c. to 5.25c.
Boat	3.80c.
Track bolts, all sizes, per 100 count,	60 per cent off list
Machine bolts, 100 count,	60 per cent off list
Carriage bolts, 100 count,	60 per cent off list
Nuts, all styles, 100 count,	60 per cent off list
Large rivets, base per 100 lb	$3.50
Wire, black, soft ann'l'd, base per 100 lb.	$2.75 to 2.85
Wire, galv. soft, base per 100 lb.	3.20 to 3.30
Common wire nails, per keg.	2.60 to 2.75
Cement coated nails, per keg	2.65 to 2.80

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel.	$16.50 to $17.50
No. 2 heavy melting steel.	14.50 to 15.00
Scrap rails	16.00 to 16.50
Compressed sheet steel	16.25 to 16.50
Bundled sheets, sides and ends	14.00 to 14.50
Cast iron carwheels	14.50 to 15.00
Sheet bar crops, ordinary.	18.00 to 18.50
Heavy breakable cast	12.00 to 13.00
No. 2 railroad wrought	16.50 to 17.00
Hvy. steel axle turnings	14.00 to 14.50
Machine shop turnings	11.50 to 12.00
Acid Open-Hearth Grades:	
Railr. knuckles and couplers	20.50 to 21.00
Railr. coil and leaf springs	20.50 to 21.00
Rolled steel wheels	20.50 to 21.00
Low phos. billet and bloom ends	21.00 to 22.00
Low phos. mill plates	20.50 to 21.00
Low phos. light grades	19.50 to 20.50
Low phos. sheet bar crops	20.50 to 21.00
Heavy steel axle turnings.	14.00 to 14.50
Electric Furnace Grades:	
Low phos. punchings	18.50 to 19.50
Hvy. steel axle turnings	14.00 to 14.50
Blast Furnace Grades:	
Short shoveling steel turnings	11.75 to 12.25
Short mixed borings and turnings	11.75 to 12.25
Cast iron borings	11.75 to 12.25
Rolling Mill Grades:	
Steel car axles	20.50 to 21.50
Cupola Grades:	
No. 1 cast	14.00 to 15.00
Rails 3 ft. and under	18.50 to 19.50

Semi-Finished Steel, Raw Materials, Bolts and Rivets

Mill Prices of Semi-Finished Steel

Billets and Blooms

	Per Gross Ton
Rerolling, 4-in. and under 10-in., Pittsburgh	$33.00
Rerolling, 4-in. and under 10-in., Youngstown	33.00
Rerolling, 4-in. and under 10-in., Cleveland	33.00
Rerolling, 4-in. and under 10-in., Chicago	34.00
Forging quality, Pittsburgh	38.00

Sheet Bars

(Open Hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$33.00
Youngstown	33.00
Cleveland	33.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$33.00
Youngstown	33.00
Cleveland	33.00

Skelp

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.85c. to 1.90c.
Universal	1.85c. to 1.90c.
Sheared	1.85c. to 1.90c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$40.00
Cleveland	40.00
Chicago	41.00

Prices of Raw Material

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algerian	12.00c.
Iron ore, low phos., Swedish, average 68% iron	12.00c.
Iron ore, basic Swedish, average 65% iron	10.00c.
Manganese ore, washed, 52% manganese, from the Caucasus	30.00c.
Manganese ore, Brazilian, African or Indian, basic 50%	30.00c.
Tungsten ore, high grade, per unit, in 60% concentrates	$15.50 to $16.50

	Per Gross Ton
Chrome ore, 45 to 50% Cr_2O_3, crude, c.i.f. Atlantic seaboard	$22.00 to $24.00

	Per Lb.
Molybdenum ore, 85% concentrates of MoS_2, delivered	50c. to 55c.

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville prompt	$2.60
Foundry, f.o.b. Connellsville prompt	3.50 to 4.75
Foundry, by-product, Ch'go ovens	8.00
Foundry, by-product, New England, del'd	11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to 9.40
Foundry, by-product, Phila.	9.00
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry by-prod., del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.25 to $1.75
Mine run coking coal, f.o.b. W. Pa. mines	1.50 to 1.75
Gas coal, ¾-in. f.o.b. Pa. mines	1.90 to 2.00
Mine run gas coal, f.o.b. Pa. mines	1.65 to 1.75
Steam slack, f.o.b. W. Pa. mines	80c. to 90c.
Gas slack, f.o.b. W. Pa. mines	1.00 to 1.10

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard	$94.00 to $99.00
Foreign, 80%, Atlantic or Gulf port, duty paid	94.00 to 99.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$31.00 to $34.00
Domestic, 16 to 19%	29.00 to 32.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50%	$83.50
75%	130.00

Per Gross Ton Furnace		Per Gross Ton Furnace	
10%	$35.00	12%	$39.00
11%	37.00	14 to 16%	45.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
10%	$30.00	12%	$34.00
11%	32.00		

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
6%	$22.00 to $23.00	10%	$26.00 to $28.00
7%	23.00 to 24.00	11%	28.00 to 30.00
8%	24.00 to 25.00	12%	30.00 to 32.00
9%	25.00 to 26.00		

Other Ferroalloys

Ferrotungsten, per lb. contained metal del'd	$1.40 to $1.50
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrovanadium, per lb. contained vanadium, f.o.b. furnace	$3.15 to $3.65
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	$160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton	$91.00
Ferrophosphorus, electric 24%, f.o.b. Anniston, Ala., per gross ton	$122.50

Fluxes and Refractories

Fluorspar

	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines	$18.00
No. 2 lump, Illinois and Kentucky mines	20.00
Foreign, 85% calcium fluoride, not over 5% silica, c.i.f. Atlantic port, duty paid	$18.25 to 18.75
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silica, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick

	Per 1000 f.o.b. Works	
	High-Heat Duty Brick	Intermediate Heavy Duty Brick
Pennsylvania	$43.00 to $46.00	$35.00 to $38.00
Maryland	43.00 to 46.00	35.00 to 38.00
New Jersey	50.00 to 65.00	.....
Ohio	43.00 to 46.00	35.00 to 38.00
Kentucky	43.00 to 46.00	35.00 to 38.00
Missouri	43.00 to 46.00	35.00 to 38.00
Illinois	43.00 to 46.00	35.00 to 38.00
Ground fire clay, per ton	7.00	

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$43.00
Chicago	52.00
Birmingham	50.00
Silica clay, per ton	$8.50 to 10.00

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Standard size	45.00

Chrome Brick

	Per Net Ton
Standard size	$45.00

Mill Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts

Per 100 Pieces

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
†Machine bolts	70
†Carriage bolts	70
Lag bolts	70
Plow bolts, Nos. 1, 2, 3 and 7 heads	70
Hot-pressed nuts, blank or tapped, square	70
Hot-pressed nuts, blank or tapped, hexagons	70
C.p.c. and t. square or hex. nuts, blank or tapped	70
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.

†Bolts with rolled thread up to and including ¾ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagon nuts	70
Semi-finished hexagon castellated nuts, S.A.E.	70
Stove bolts in packages, P'gh.	75, 20, 10 and 5
Stove bolts in packages, Chicago.	75, 20, 10 and 5
Stove bolts in packages, Cleveland.	75, 20, 10 and 5
Stove bolts in bulk, P'gh.	75, 20, 10, 5 and 2½
Stove bolts in bulk, Chicago.	75, 20, 10, 5 and 2½
Stove bolts in bulk, Cleveland.	75, 20, 10, 5 and 2½
Tire bolts	60, 5 and 5

Discounts of 70 per cent off on bolts and nuts applied on carload business. For less than carload orders discounts of 55, 60 per cent apply.

Large Rivets

(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$3.10
F.o.b. Chicago	3.20

Small Rivets

(7/16-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70 and 10
F.o.b. Cleveland	70 and 10
F.o.b. Chicago	70 and 10

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws	80, 10 and 5
Milled standard set screws, case hardened	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S. thread	85 and 10
Upset hex. cap screws, S.A.E. thread	85 and 10
Upset set screws	80, 10 and 5
Milled studs	70

Chicago

Demand for Steel Pushes Production Higher and Delivery Is Beginning to Lengthen

CHICAGO, Feb. 10.—A gain of several points in ingot output has brought production to 90 per cent of capacity. One rail mill is operating at full capacity and the other unit is scheduled to reach its rated capacity by the end of the month. Consumer interest, though not so large as in the previous week, is still ample to assure continuation for the time being of the present rate of ingot production.

Most of the new orders are still at close range, though users are being forced to look further ahead as deliveries become less satisfactory. Producers feel, as gaged by pressure for shipments, that by far the bulk of steel being taken is for immediate consumption, and that buyers are holding steadfastly to the practice of maintaining stocks within narrow margins. Average deliveries on plates and shapes are now four to five weeks, and soft steel bars may be had in four to six weeks.

New specifications are fully up to the average so far this year. Recent purchases are in moderate volume, but this is not surprising to sellers, who experienced unusually heavy business in the previous week.

An encouraging angle to the market is a sharp increase in inquiries for structural materials. Important among new requests for prices are sizable tonnages for railroad bridge work. In the shadow of the market are 100,000 tons of plates and 5000 tons of shapes for a gas line, contracts for which were let late last year. A similar project, which will call for 500 miles of pipe, is being developed in Texas. Demand for semi-finished steel is keeping pace with the general markets and producers have been forced in the past week to give closer attention to apportionment among customers.

Car builders say American Refrigerators Transit Co. has inquired for 1000 cars, which may be increased to 2000. A local steel company has inquiries for the steel for 2000 cars.

Pig Iron.—Shipments of Northern foundry iron continue to grow and now are well in excess of current production. At the moment February shipments are running fully 15 per cent ahead of the rate in January. Sales, a large part of which are for nearby needs, are numerous. There are indications that prices for silvery iron are stronger. Sellers of Southern iron, who earlier in the year endeavored to hold to $13.50 a ton, Birmingham, for delivery in this territory, have gone back to the spread of $13 to $13.50 a ton. Scattered inquiries for small lots of Southern iron are more numerous.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	$20.00
N'th'n No. 1 fdy., sil. 2.25 to 2.75	20.50
Malleable, not over 2.25 sil.	20.00
High phosphorus	20.00
Lake Super. charcoal, sil. 1.50	27.04
S'th'n No. 2 fdy. (all rail)	$19.01 to 19.51
Low phos., sil. 1 to 2, copper free	29.50
Silvery, sil. 8 per cent	$28.79 to 29.79
Bess. ferrosilicon, 14-15 per cent	46.29

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Ferroalloys.—Local sellers of ferromanganese have been informed of price differentials for tonnages consumed. A buyer using up to 500 tons annually will be asked $99 a ton, seaboard. The price for 500 to 1000 tons will be $98; 1000 to 2000 tons, $97; and 2000 tons and over, $94.

Sheets.—The Western sheet market is still in an unsatisfactory condition. Although in a few cases prices show some degree of stability, the actual trend is not well defined. Production schedules are not to the liking of sellers, for the reason that backlogs are light and buying is for immediate use, with pressure for prompt delivery. Hot mills scheduled for only a week in advance are operating at 75 per cent of capacity, with little assurance as to the course of business in the next week. The two automobile manufacturers near Chicago are in the market for body sheets. Shipments to the roofing trade are large.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 2.80c. to 2.90c.; No. 24 galv., 3.45c. to 3.55c.; No. 10 blue ann'l'd, 2.35c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars	3.00c.
Reinforc'g bars, billet steel—	
Under 5 tons	2.85c.
5 tons to 30 tons	2.45c.
30 tons and over	2.00c.
Rail steel reinforcement	1.75c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.60c.
Flats and squares	4.10c.
Bands (¼ in. in Nos. 10 and 12 gages)	3.20c.
Hoops (No. 14 gage and lighter)	3.75c.
Black sheets (No. 24)	4.05c
Galv. sheets (No. 24)	4.60c
Blue ann'l'd sheets (No. 10)	3.35c.
Spikes, ½ in. and larger	3.55c.
Track bolts	4.55c.
Rivets, structural	4.00c.
Rivets, boiler	4.00c.

	Per Cent Off List
Machine bolts	60
Carriage bolts	60
Coach or lag screws	60
Hot-pressed nuts, sq., tap. or blank	60
Hot-pressed nuts, hex., tap. or blank	60
No. 8 black ann'l'd wire, per 100 lb.	$3.45
Com. wire nails, base per keg	$2.85 to 2.95
Cement c't'd nails, base per keg	2.85 to 2.95

Cast Iron Pipe.—Demand for cast iron pipe continues to grow and prices are stronger. The bulk of tonnage now moving in this territory is at $37 to $38 a ton, Birmingham. Private buying is more of a market factor this week and inquiry, though generally for small lots, shows marked improvement. Several tonnages have been placed by public utilities and additional orders are expected by the trade in the near future. The award of 700 tons by Wauwatosa, Wis., has been delayed, and formal orders for a sizable tonnage for St. Louis Park, Minn., are not expected to be signed before Feb. 17. Among recent awards are 200 tons to the American Cast Iron Pipe Co. by La Crosse, Wis., and 100 tons of 2 to 8-in. pipe for Muscatine, Iowa, and 9000 ft. of 4 and 6-in. pipe for Bay City, Mich., both of which have been taken by McWane Cast Iron Pipe Co. Huron, S. D., is in the market for 150 tons of 6 and 10-in. pipe, and Rochester, Minn., will buy 400 tons of 6 to 12-in. pipe. Appleton, Wis., will open bids Feb. 17 on 10,000 ft. of 6-in. pipe.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, $45.20 to $46.20; 4-in., $48.20 to $49.20; Class A and gas pipe, $3 extra.

Rails and Track Supplies.—Current purchases of standard-section rails are confined to odd lots from small users. An electric railway system near Chicago has ordered 1000 tons and several like lots are in the making. Several Western railroads have placed orders for a total of 12,000 tons of track accessories. Railroads are taking heavier shipments of track supplies and, as their needs mount with the approach of spring, large new purchases are expected. One Western rail mill is operating at capacity, with sufficient tonnage on its books to maintain full output to the end of May or even well into June. Another rail mill will reach full capacity near the end of this month. Railroads are pressing harder for deliveries. Track accessory departments are near capacity in the manufacture of tie plates and angle bars. Facilities for making track bolts and spikes are larger than is the case with tie plates and splice bars, and these departments are operating at correspondingly lower rates of output. The light rail market is without feature.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Bess. rails, $43; light rails, rolled from billets, $36. *Per lb.:* Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 2.07½c. to 2.15c.; angle bars, 2.75c.

Plates.—The local trade is expecting at any moment to receive releases against contracts calling for 100,000 tons of plates to be used for the manufacture of gas line pipe which will bring natural gas from the Southwest fields to Chicago. Another project of similar character is that of the South Plains Pipe Line Co., a subsidiary of the Prairie Oil and Gas Co., which

has announced plans for construction of 500 miles of additional gas lines in northwest and west Texas. The Paso-Tex Co. has ordered 2000 tons of plates for tank construction and the Humble Oil Co. is in the market for 3000 tons of plates, which are to be delivered to the Southwest. Activity on the part of oil producers is gaining momentum. It is estimated that not less than 20,000 tons of tank plates will be ordered this spring. On the score of the active needs of car builders and miscellaneous users, the Chicago plate market is rapidly moving forward. It is reported that the American Refrigerator Transit Co. has increased its inquiry from 1000 to 2000 refrigerator cars. There is some disappointment here as to the placing of the Chesapeake & Ohio and subsidiary lines car orders. Local mills had expected to supply steel for about 7000 cars, whereas it now appears that the tonnage to be diverted to Western mills will not exceed 60,000 tons for 4000 cars. Heavier specifications from numerous directions continue to delay deliveries, which now range from four to five weeks on most sizes.

Structural Material. — Encouragement comes to this market in fresh inquiries totaling more than 8000 tons. These reflect greater interest than has been shown in any week since the first of the year. About 1800 tons of this business is from three Western railroads that are contemplating new bridge work. Orders placed this week include 800 tons for bridges for the Northern Pacific. Inquiries from outlying sections of the Middle West still outweigh those in the immediate Chicago district. Local improvement work is being held in check by reassessment measures which have delayed issuance of tax bills for over a year. The needs of miscellaneous users and the demands upon structural mills by car builders are forcing back deliveries, which now range from four to five weeks on many of the common sizes.

Mill prices on plain material, per lb.: 1.95c. to 2.00c. base, Chicago.

Old Material.—Heavy melting steel has advanced 25c. a ton on sizable sales to consumers. For small tonnages of carefully selected grades as high as $14 a gross ton, delivered, has been paid. Shipments to mills are heavier and the rigid inspection which was the rule in January is no longer closely practiced. Movement of scrap by railroads and from industrial plants is in larger volume as winter weather passes, though the trade does not expect the peak movement to be reached until the early part of April. Rolled steel wheels are more active and prices have advanced $1 a ton. Interest in cast iron wheels is growing and recent sales have brought prices up to $15 a ton, delivered. Consumer interest is growing in cast iron borings and the low phosphorus grades are in active demand. The market for rerolling rails is quiet in view of sizable tonnages in the yards of consumers. Dealers report that producers generally are willing to ship scrap soon after it is prepared and that the incentive to hold and to speculate on higher prices is almost wholly absent from the market.

Prices deliv'd Chicago district consumers:

Per Gross Ton

Basic Open-Hearth Grades:	
Heavy melting steel	$13.25 to $13.50
Shoveling steel	13.25 to 13.50
Frogs, switches and guards, cut apart, and misc. rails	14.00 to 14.50
Hydraul. compressed sheets	12.00 to 12.25
Drop forge flashings	9.75 to 10.25
No. 1 busheling	11.00 to 11.50
Forg'd cast and r'l'd steel carwheels	18.50 to 19.00
Railroad tires, charg. box size	17.75 to 18.25
Railroad leaf springs cut apart	17.50 to 18.00
Acid Open-Hearth Grades:	
Steel couplers and knuckles	16.00 to 16.50
Coil springs	18.25 to 18.75
Electric Furnace Grades:	
Axle turnings	12.75 to 13.25
Low phos. punchings	15.50 to 16.00
Low phos. plates, 12 in. and under	15.50 to 16.00
Blast Furnace Grades:	
Axle turnings	10.75 to 11.25
Cast iron borings	10.00 to 10.50
Short shoveling turnings	9.75 to 10.25
Machine shop turnings	7.75 to 8.25
Rolling Mill Grades:	
Iron rails	14.50 to 15.00
Rerolling rails	15.00 to 15.50
Cupola Grades:	
Steel rails less than 3 ft.	16.75 to 17.25
Steel rails less than 2 ft.	18.50 to 19.00
Angle bars, steel	15.50 to 16.00
Cast iron carwheels	14.50 to 15.00
Malleable Grades:	
Railroad	17.00 to 17.50
Agricultural	14.50 to 15.00
Miscellaneous:	
*Relaying rails, 56 to 60 lb.	23.00 to 25.00
*Relaying rails, 65 lb. and heav.	26.00 to 31.00

Per Net Ton

Rolling Mill Grades:	
Iron angle and splice bars	15.00 to 15.50
Iron arch bars and transoms	17.00 to 17.50
Iron car axles	25.50 to 26.00
Steel car axles	16.50 to 17.00
No. 1 railroad wrought	12.25 to 12.75
No. 2 railroad wrought	11.75 to 12.00
No. 1 busheling	9.00 to 9.50
No. 2 busheling	7.00 to 7.50
Locomotive tires, smooth	14.50 to 15.00
Pipes and flues	9.50 to 10.00
Cupola Grades:	
No. 1 machinery cast	13.50 to 14.00
No. 1 railroad cast	13.00 to 13.50
No. 1 agricultural cast	12.00 to 12.50
Stove plate	10.75 to 11.25
Grate bars	10.75 to 11.25
Brake shoes	10.75 to 11.25

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

Bars.—Specifications for mild steel bars in January were 16 per cent heavier than in the first month in 1929. The February rate of shipments is fully up to that in the preceding month and schedules now arranged forecast a steady climb in shipments. Although sales a week ago were unusually heavy, new purchases in the last seven days have also been large. This gain in demand is resulting in satisfactory schedules at mills and a further backing up of promises of deliveries, which now are not better than four to six weeks. Operations of alloy steel bar mills have been advanced several points to 65 per cent of capacity, following a steady, though moderate, growth in specifications from manufacturers of automobile and allied lines. In some instances the needs of automobile plants are as large as a year ago. Prices for alloy steel bars are steady. The iron bar market is quiet. Specifications for rail steel bars are fully equal to production, which has been steadily gaining. Backlogs are light because of the character of buying, which is unchanged from extremely close range needs and pressure for prompt delivery. Specifications for fence posts are disappointing, but sellers attribute this situation to the unusually long and severe winter.

Reinforcing Bars.—There has been general adoption of the practice of publishing prices for reinforcing bars sold from Chicago warehouses. The open quotation now on billet stock is 2c. a lb. for lots of 30 tons and larger, and rail steel reinforcement in like quantities is priced 1.75c. a lb. Feb. 7 was named by many dealers as the deadline for all old outstanding quotations. The building loan situation is still unfavorable to a construction program which gives evidence otherwise of being ready to move forward. Preliminary plans are fairly numerous, but only a few of these are reaching estimators. Backlogs at shops are unusually light for this time of the year and shop operations, which are not getting adequate support from the few awards, are pointing downward. Illinois roadwork gives promise of bringing tonnage into the market. Reports indicate that $50,000,000 will be expended on the Illinois State highway system.

Wire Products.—Specifications from the jobbing trade are not only below expectations of the trade for this time of the year but they are lighter this week than at the turn of the month. Sellers are inclined to view the weather as the underlying reason for this situation. Much of the northern part of the country is still held in the grip of winter. The South-Central States, east of the Mississippi River, have been visited by winter floods and several cold waves have spread over parts of the South, and the season is backward. Prices for cotton, also, are given as a reason for the comparative dullness of business in the South, where at this time of the year distribution should be active. Shipments of fencing are gradually growing, but this improvement is slower than usually expected in early February. Specifications from the manufacturing trade are heavier.

Bolts, Nuts and Rivets.—Release orders for these commodities are steady and schedules now arranged for the latter part of February indicate heavier deliveries at that time. Prices for bolts and nuts are steady at 70 per cent off list. Demand for small rivets is not quite equal to a year ago, largely because of the lighter needs of automobile manufacturers. Quotations are steady at 70 and 10 per cent off list.

Coke. — Shipments of by-product foundry coke are a shade larger, reflecting a heavier melt by local foundries. Prices remain firm at $8 a ton, f.o.b. local furnace.

New York

Buffalo Foundry Iron Off 50c. a Ton—Steel Demand Is Maintained, With Prices Steadier

NEW YORK, Feb. 10.—Pig iron sales, at 9500 tons, were larger than in recent weeks, but demand cannot be described as active. Open inquiries are few, and to a large extent business is uncovered only after thoroughly canvassing the trade. Although second quarter buying is usually under way by this time, interest in next quarter is still at a low ebb and considerable first quarter tonnage remains unbought, possibly 35 per cent of the requirements of the district. The hesitancy of melters is due in part to the uncertainty of their own operations. Although total melt appears to be gaining, the improvement is gradual and unevenly distributed. Some of the foundries serving the machine tool industry are running at barely half the rate of a year ago. On the other hand, foundries making sash weights and other building accessories are increasing their operations. Delay in buying is also due to the uncertainty of prices. Competition among sellers remains keen, and a sale of a moderate tonnage during the week brought out a flat price of $16, Buffalo, for No. 2 plain and No. 1X. Pending business, including tonnage not formally inquired for, is estimated at 3000 tons. The General Electric Co., which has bought 200 tons for Schenectady, N. Y., is in the market for 600 tons for Elmira, N. Y. The Farrel-Birmingham Co., Ansonia, Conn., is inquiring for 300 to 500 tons. The General Fire Extinguisher Co., Providence, R. I., has not yet closed for 1000 tons. The American Locomotive Co. has placed 500 tons for Schenectady.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil. 1.75 to 2.25	$20.91 to $21.41
*Buff. No. 2, del'd east. N. J.	19.28 to 19.78
East. Pa. No. 2 fdy., sil. 1.75 to 2.25	19.89 to 21.02
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	20.39 to 21.52

Freight rates: $4.91 from Buffalo, $1.39 to $2.52 from eastern Pennsylvania.

*Prices delivered to New Jersey cities having rate of $3.28 a ton from Buffalo.

Finished Steel.—Orders for steel products during the past week held at about the volume of the last week of January. Some sales offices report a slight gain, while one or two did not do so well. Thus is the spottiness of demand shown. On the score of prices, there has been an improvement in that some of the very low quotations have disappeared. Some mills which have been meeting competition on sheets have announced to their customers that they will not accept orders at less than 2.65c., Pittsburgh, for black sheets; 3.30c. for galvanized and 2.10c. for blue annealed light plates. Eastern plate mills have got the plate price back to a point approaching stabilization, and may announce an advance to a minimum of 1.95c., Coatesville, Pa., or 2.12½c., delivered New York. Steel bars are fairly firm at 1.85c., Pittsburgh. Structural steel inquiries are increasing in number as the spring building season approaches. January bookings of structural steel for work which does not include civil engineering projects, as tunnels, bridges, etc., was 34,951 tons, as compiled by the Structural Steel Board of Trade of New York for the New York district. This compares with 104,549 tons in December and 27,626 tons in January, 1929.

Mill prices per lb., deliv'd New York: Soft steel bars, 2.19c. to 2.24c.; plates, 2.07½c. to 2.12½c.; structural shapes, 2.04½c. to 2.14½c.

Ferroalloys.—Announcement last week of a change in prices of ferromanganese is confirmed as applying to both domestic and foreign producers. The changes are based upon the consumption per year of the consumer. That is, if a steel maker used in 1929 more than 2000 tons, he can now purchase at the rate of $94 a ton, seaboard basis. The price to users of 100 to 500 tons annually is $99 a ton, from 500 to 1000 tons, $98 a ton, and from 1000 to 2000 tons, $97 a ton. In other words, a consumer who used last year more than 2000 tons can now purchase 50 tons at $94. The revised prices are retroactive to Jan. 1 this year on all contracts negotiated earlier for consumption in 1930. The market is quiet and orders for occasional carloads are reported. Demand for spiegeleisen is confined to carload lots, mostly for early delivery, with now and then some foreign alloy negotiated.

Cast Iron Pipe.—Prices are being maintained, but the total tonnage of pipe in the market is smaller than during the first half of last month. About 700 tons of gas pipe for utilities in the New England district and the South, inquired for by Stone & Webster, Boston, has been placed with the Warren Foundry & Pipe Co. and the Lynchburg Foundry Co. The low bidder on 400 tons of 30-in. water pipe for Yonkers, N. Y., was the Donaldson Iron Co. The Municipal Water Works, Springfield, Mass., opened bids Feb. 10 on about 625 tons of 6 and 8-in. pipe.

Prices per net ton deliv'd New York: Water pipe, 6-in. and larger, $38.60; 4-in. and 5-in., $41.60; 3-in., $48.60. Class A and gas pipe $3 extra.

Warehouse Business.—Quantity extras on cold-finished steel bars have been partly revised by jobbers in this district. Formerly an extra of 75c. a 100 lb. was charged on orders for 500 to 999 lb. and 40c. a 100 lb. on quantities of 1000 to 1999 lb. The revised extra is 40c. a 100 lb. for orders of 500 to 1999 lb. The other quantity extras are unchanged. New cutting extras were adopted, as reported last week. The base prices are 3.40c. a lb. on rounds and hexagons and 3.90c. on flats and squares. Business con-

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and structural shapes	3.30c.
Soft steel bars, small shapes	3.25c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons	3.40c.
Flats and squares	3.90c.
Cold-roll. strip, soft and quarter hard	5.05c.
Hoops	4.25c.
Bands	3.75c.
Blue ann'l'd sheets (No. 10)	3.25c. to 3.90c.
Long terne sheets (No. 24)	5.80c.
Standard tool steel	12.00c.
Wire, black annealed	4.50c.
Wire, galv. annealed	5.15c.
Tire steel, ½ x ½ in. and larger	3.40c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.75c.
Open-hearth spring steel, bases,	4.50c. to 7.00c.

	Per Cent Off List
Machine bolts, cut threads:	
¾ x 6 in. and smaller	60
1 x 30 in. and smaller	50 to 50 and 10
Carriage bolts, cut thread:	
½ x 6 in. and smaller	60
¾ x 20 in. and smaller	50 to 50 and 10
Coach Screws:	
½ x 6 in. and smaller	60
1 x 6 in. and smaller	50 to 50 and 10

Boiler Tubes—	Per 100 Ft.
Lap welded, 2-in.	$19.00
Seamless steel, 2-in.	20.25
Charcoal iron, 2-in.	26.25
Charcoal iron, 4-in.	67.00

Discounts on Welded Pipe

Standard Steel—	Black	Galv.
⅛-in. butt	46	29
¼-in. butt	51	37
1-3-in. butt	53	39
2½-6-in. lap	48	35
7 and 8-in. lap	44	17
11 and 12-in. lap	37	12
Wrought Iron—		
⅛-in. butt	5	+19
¼-in. butt	11	+ 9
1-1½-in. butt	14	+ 6
2-in. lap	5	+14
3-6-in. lap	11	+ 6
7-12-in. lap	3	+16

Tin Plate (14 x 20 in.)

	Prime	Seconds
Coke, 100 lb. base box	$6.45	$6.20
Charcoal, per Box—	A	AAA
IC	$9.70	$12.10
IX	12.00	14.25
IXX	13.90	16.00

Terne Plate (14 x 20 in.)

IC—20-lb. coating	$10.00 to $11.00
IC—30-lb. coating	12.00 to 13.00
IC—40-lb. coating	13.75 to 14.25

Sheets, Box Annealed—Black, C. R. One Pass

	Per Lb.
Nos. 18 to 20	3.60c. to 3.70c.
No. 22	3.75c. to 3.85c.
No. 24	3.80c. to 3.90c.
No. 26	3.90c. to 4.00c.
No. 28*	4.05c. to 4.15c.
No. 30	4.30c. to 4.40c.

Sheets, Galvanized

	Per Lb.
No. 14	4.00c. to 4.15c.
No. 16	3.85c. to 4.00c.
No. 18	4.00c. to 4.15c.
No. 20	4.10c. to 4.25c.
No. 22	4.20c. to 4.35c.
No. 24†	4.35c. to 4.50c.
No. 26	4.60c. to 4.75c.
No. 28*	4.85c. to 5.00c.
No. 30	5.25c. to 5.40c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

†For 50 bundles or more, 25c. per 100 lb. or less.

tinues fair, but orders for products out of stock are still small.

Coke.—Foundry coke specifications show some signs of picking up, but aside from the contract tonnage being released little new business is developing. Furnace coke continues to range from $2.65 to $2.75, Connellsville. Special grades of beehive foundry coke are bringing $4.85 a net ton, Connellsville, or $8.56, delivered Jersey City, Newark and other northern New Jersey points, and $9.44, New York and Brooklyn. By-product foundry coke is quoted at $9 to $9.40 a net ton, Newark or Jersey City, and $10.06, New York or Brooklyn.

Old Material.—Dullness has continued in the iron and steel scrap market for a longer period than in some years. No. 1 heavy melting steel is still being bought by brokers at $14 a ton, delivered Eastern Pennsylvania. The list of scrap offered this month by the Pennsylvania Railroad, about 40,000 tons, went principally to the Pittsburgh district, the heavy melting steel bringing about $17.50 a ton, delivered.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel	$10.50 to $11.35
Heavy melting steel (yard)	7.50 to 8.00
No. 1 hvy. breakable cast.	9.75 to 10.50
Stove plate (steel works)	8.00
Locomotive grate bars	8.25
Machine shop turnings	7.00 to 7.50
Short shoveling turnings	7.25 to 7.50
Cast borings (blast fur. or steel works)	7.00 to 7.50
Mixed borings and turnings	6.75 to 7.50
Steel car axles	15.25 to 16.25
Iron car axles	20.50 to 21.00
Iron and steel pipe (1 in. dia., not under 2 ft. long)	9.25 to 9.75
Forge fire	8.50 to 9.00
No. 1 railroad wrought	11.50 to 12.50
No. 1 yard wrought, long	10.50 to 11.50
Rails for rolling	10.50 to 11.00
Stove plate (foundry)	8.25 to 8.50
Malleable cast (railroad)	12.50 to 13.00
Cast borings (chemical)	8.50 to 9.50

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast	$15.00
No. 1 hvy. cast (columns, bldg. materials, etc.), cupola size	13.00
No. 2 cast (radiators, cast boilers, etc.)	12.50

Cleveland

Steel Demand Is Well Maintained and a Firmer Stand on Prices Is in Prospect

CLEVELAND, Feb. 10.—Demand for finished steel is holding up to recent good volume and business in some products shows a further increase. The leading local producer has increased its bar mill operations to 100 per cent capacity. Automobile manufacturers are ordering steel in good volume for early requirements.

January production of motor cars aggregated 300,000 units, compared with slightly over 400,000 during the same month last year. The Ford and Chevrolet companies will show quite an increase in output this month, but it is not expected that February production by makers of medium and high-priced cars will gain much over January. The Erie Railroad has placed 2150 freight cars, making a total purchase of 13,500 cars by the Van Sweringen roads in the past week.

Little change has developed in the price situation. While sheets are still weak, some of the mills are taking a firmer stand on prices, and will not take orders at present quotations for shipment beyond March, hoping to get somewhat better prices in the second quarter.

Pig Iron.—Inquiry declined the past week and sales fell off slightly. Cleveland interests sold 22,500 tons during the week. Some foundries are still buying from hand to mouth, and others are holding off until they use up some iron still due on contracts. Shipping orders still show an upward tendency, particularly from the automotive industry. With increase in steel plant operation local producers are not so anxious for pig iron business as recently, and are less disposed to seek business in competitive territories, where concessions from the $18.50 Cleveland price are necessary. For local delivery the price is unchanged at $19, furnace. Aside from waiving of differentials in some sections, prices appear to be well maintained.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25	$19.50
S'th'n fdy., sil. 1.75 to 2.25	19.51
Malleable	19.50
Ohio silvery, 8 per cent	28.00
Basic Valley furnace	18.50
Stand. low phos., Valley	26.50 to 27.00

Prices except on basic and low phosphorus are delivered Cleveland. Freight rates: 50c. from local furnaces; $3 from Jackson, Ohio; $6.01 from Birmingham.

Iron Ore.—The dock balance of Lake Superior ore Feb. 1 was 5,853,864 gross tons, as compared with 5,310,687 tons on the same date a year ago, according to the monthly report of the Lake Superior Iron Ore Association. Dock shipments are rather light. Movement from Lake Erie docks to interior furnaces during January was 289,339 tons, as against 383,703 tons during the same month last year.

Semi-Finished Steel.—Specifications for sheet bars, billets and slabs are fairly heavy. The market is firm at $33, Cleveland. Wire rods are moving well against $40 contracts.

Sheets.—Demand for sheets showed a further gain during the week, both in specifications and in new business. A good volume of orders came from makers of automobile stampings. Demand has become more active for metal furniture sheets and enameling stock. Quite a few consumers are asking mills to speed up deliveries. Most producers are holding to 2.65c. on black sheets, and efforts may be made to advance to 2.75c. for the second quarter. Quotations on blue annealed sheets by jobbing mills are unchanged at 2.10c. for No. 10 and 2.25c. for No. 13. While continuous mill prices are commonly $2 a ton lower, quotations as low as 1.90c. for No. 10 and 2.05c. for No. 13 are reported. On galvanized sheets 3.30c. has become more common. Shading to 3.90c. on metal furniture sheets is rather general.

Strip Steel.—Demand for cold-rolled strip has improved quite a little, car-lot business being placed during the week. Hot-rolled strip is moving fairly well. Prices are holding fairly firm at 1.80c. for wide and 1.90c. for narrow strip. Cold-rolled strip is firm at 2.65c., Cleveland.

Wire Products.—With spring buying under way, demand for nails has improved. Prices are somewhat irregular. Mills and jobbers are quoting nails at $2.35 a keg, Cleveland, to dealers. Manufacturers' wire is in good demand and is firm at 2.40c.

Steel Bars, Plates and Shapes.—Good releases from automobile manufacturers and parts makers' orders for steel bars continue fairly heavy, and consumers' stocks are still low. Plates are in fair demand for small lots, and structural shapes are moving moderately well, although not much work is coming out in the building field. Inquiry is out for the Mayflower Hotel, Akron, requiring 2200 tons. Recent irregularies in steel bar prices seem to have disappeared, and the market is firm at 1.85c., Cleveland. On plates and shapes 1.85c., Pittsburgh, is maintained in this market.

Cold-Finished Steel Bars.—Some of the manufacturers of screw machine products in the motor car industry are now fairly busy and specifications from this source have improved. The market is firm at 2.10c., Cleveland.

Bolts, Nuts and Rivets.—Orders for bolts and nuts are fair, business so far this month being in about the same volume as late in January. Orders are well distributed among motor car and other manufacturers, jobbers and railroads. The industry is operating at about 65 per cent of ca-

Warehouse Prices, f.o.b. Cleveland

	Base per Lb.
Plates and struc. shapes	3.00c.
Soft steel bars	3.00c.
Reinforc. steel bars	2.25c. to 2.50c.
Cold-fin. rounds and hex	3.65c.
Cold-fin. flats and sq.	4.15c.
Hoops and bands, No. 12 to ¼ in., inclusive	3.25c.
Hoops and bands, No. 13 and lighter	3.65c.
Cold-finished strip	*5.95c.
Black sheets (No. 24)	3.75c.
Galvanized sheets (No. 24)	4.50c.
Blue ann'l'd sheets (No. 10)	3.25c.
No. 9 ann'l'd wire, per 100 lb.	$2.60
No. 9 galv. wire, per 100 lb.	3.05
Com. wire nails, base per keg	2.65

*Net base, including boxing and cutting to length.

pacity. Rivets are moving slightly better than last month. The Champion Rivet Co. will furnish 250 tons for the 120 locomotives recently placed by the Van Sweringen railroads. The freight cars purchased by the same railroads will require 4000 tons. Orders for these, aside from those made by some of the car companies themselves, will probably be split up. Prices are being well maintained.

Old Material.—The market became more active the past week and prices advanced on steel-making grades. One Cleveland mill bought a moderate tonnage of selected heavy melting steel scrap at $14.90 and another consumer purchased a small lot. Dealers are paying $14 to $14.25 for ordinary heavy melting steel for one local mill and $14.50 to $14.60 for the selected grade used by another Cleveland consumer. One mill bought a small lot of short shoveling turnings at $11.50. This material, as well as compressed sheet steel and machine shop turnings, have advanced 50c. a ton. All local mills are now taking scrap in good quantities.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$14.00 to $14.50
No. 2 heavy melting steel	13.25 to 13.75
Compressed sheet steel	13.00 to 13.50
Light bundled sheet stampings	11.50 to 12.00
Drop forge flashings	12.00 to 12.50
Machine shop turnings	10.25 to 10.75
Short shoveling turnings	11.50 to 12.00
No. 1 railroad wrought	13.00 to 13.50
No. 2 railroad wrought	14.00 to 14.50
No. 1 busheling	12.00 to 12.50
Pipes and flues	9.00 to 9.50
Steel axle turnings	12.50 to 13.00
Acid Open-Hearth Grades:	
Low phos., forging crops	17.75 to 18.00
Low phos., billet bloom and slab crops	18.50 to 18.75
Low phos., sheet bar crops	18.00 to 18.50
Low phos., plate scrap	18.00 to 18.50
Blast Furnace Grades:	
Cast iron borings	10.50 to 11.00
Mixed borings and short turnings	10.50 to 11.00
No. 2 busheling	10.00 to 10.50
Cupola Grades:	
No. 1 cast	15.25 to 15.75
Railroad grate bars	11.00 to 12.00
Stove plate	12.00 to 12.50
Rails under 3 ft.	18.50 to 19.50
Miscellaneous:	
Railroad malleable	18.00 to 18.50
Rails for rolling	16.25 to 16.50

Philadelphia

Steel Mill Operations Improved and Prices Firmer—Buffalo and Southern Pig Iron Compete

PHILADELPHIA, Feb. 11.—Steel mill operations have been advanced as much as 5 per cent by certain eastern Pennsylvania producers, so that the present rate ranges from 65 to 70 per cent and slightly better. With mills working on a larger backlog of orders, prices are developing more stability, but show no tendency to advance.

Plate mills have taken some fair tonnages and are bidding on small requirements for refineries of oil companies in addition to prospective ships. New shipbuilding projects include two tankers apiece for the Union Oil Co. of California, and the Richfield Oil Co., both of Los Angeles, requiring a total of 7000 to 8000 tons of plates. The American Pulley Co., Philadelphia, has been buying materials for a contract to manufacture shells for the Government, requirements including No. 11 gage hot-rolled single pickled sheets, head plates for the shells and strip steel.

Ferromanganese. — The quantity differentials announced last week by domestic producers have been adopted by British sellers. The new prices, fo.b. Atlantic seaboard, for either domestic or foreign metal are $99 per ton for less than 500 tons, $98 a ton for 500 to 999 tons, $97 a ton for 1000 to 1999 tons and $94 a ton for 2000 tons and more. Differentials are also applied on less-than-carload lots, which are sold f.o.b. furnace, packed in barrels, at 5.25c. per lb. for 500 to 999 lb.; 5c. per lb. for 1000 lb. to 2240 lb.; $106 a ton for more than 1 ton or less than 5 tons and $104 a ton for 5 tons to one carload. The Philadelphia Navy Yard opened bids today on 6 tons of 80 per cent ferromanganese.

Pig Iron.—Furnaces in other districts are becoming increasingly important factors in the eastern Pennsylvania market. Birmingham foundry iron is freely quoted at $13 a ton, base, furnace, with a $6.38 a ton freight rate for all-rail delivery and considerably lower rate for rail and water. Buffalo iron is quoted at $16 to $16.50 a ton, base, furnace, with an all-rail freight rate of $4.91 a ton. A northern New York furnace with a $3.65 freight rate to this district also has been active in quoting here recently. This producer recently closed about 3000 tons of foundry iron with a Baltimore consumer at a price reported to have been $19.90 a ton, delivered. The Arundel Mfg. Co., which is preparing to operate a new plant at Camden, N. J., has been obtaining prices on a substantial tonnage of foundry iron and has closed on two carload lots with an eastern Pennsylvania furnace. Low phosphorus iron continues in demand, but most of the larger users have covered their requirements and current orders are small.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	$20.76 to $21.76
East. Pa. No. 2X, 2.25 to 2.75 sil.	21.26 to 22.26
East. Pa. No. 1X	21.72 to 22.76
Basic (del'd east. Pa.)	19.50 to 19.75
Malleable	21.25 to 21.75
Stand. low phos. (f.o.b. east. Pa. furnace)	24.00
Cop. b'r'g low phos. (f.o.b. furnace)	23.00 to 24.00
Va. No. 2 plain, 1.75 to 2.25 sil.	22.29
Va. No. 2X, 2.25 to 2.75 sil.	22.79

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to $1.64 from eastern Pennsylvania furnaces; $4.54 from Virginia furnaces.

Bars.—Most of the present buying is limited to carload lots or less. Prices are unchanged at 1.85c. per lb., Pittsburgh, or 2.17c., delivered Philadelphia, for the larger orders and 1.90c., Pittsburgh, or 2.22c., Philadelphia, for small lots.

Reinforcing Bars.—Some good business is pending award. Prices are unchanged with billet steel bars at 1.95c., Pittsburgh, or 2.27c., Philadelphia, with the extra for cutting to length usually omitted. Rail steel bars are 1.80c. to 1.85c. per lb., Franklin, Pa., and Tonawanda, N. Y., or 2.12c. to 2.17c., delivered Philadelphia, with no extra for cutting to length.

Shapes.—Operating rates of shape mills have improved, but tonnage is still needed to maintain present production schedules, and prices show no tendency toward greater stability. Quotations on recent business have ranged from 1.75c. to 1.85c. per lb., f.o.b. nearest mill to consumer, or 1.81c. to 1.91c., delivered Philadelphia.

Plates. — Mills are maintaining higher rates of operation than during January and prices range from 1.90c. to 1.95c. per lb., Coatesville, Pa., or 2c. to 2.05c., delivered Philadelphia. Small orders from oil companies have provided some tonnage and shipbuilding projects are expected to contribute some good business for the second quarter. Plates required for the 11,300 cars ordered by the Chesapeake & Ohio Railroad are not expected to go to eastern Pennsylvania mills, except possibly for the cars which may be built at Berwick, Pa.

Sheets.—Mills are better engaged than for some weeks and prices are slightly firmer. Blue annealed sheets are quoted at 2.20c. per lb., base, Pittsburgh, or 2.52c., delivered Philadelphia,

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier	2.70c.
Plates, ⅜-in.	2.90c.
Structural shapes	2.70c.
Soft steel bars, small shapes, iron bars (except bands)	2.80c.
Round-edge iron	3.50c.
Round-edge steel, iron finished 1½ x 1½ in.	3.50c.
Round-edge steel planished	4.30c.
Reinforc. steel bars, sq., twisted and deform.	2.60c. to 2.80c.
Cold-fin. steel, rounds and hex.	3.40c.
Cold-fin. steel, sq. and flats	3.90c.
Steel hoops	3.55c.
Steel bands, No. 12 to ⅜-in. inclus.	3.30c.
Spring steel	5.00c.
*Black sheets (No. 24)	3.80c.
†Galvanized sheets (No. 24)	4.45c.
Light plates, blue annealed (No. 10)	3.25c.
Blue ann'l'd sheets (No. 13)	3.40c.
Diam. pat. floor plates—	
¼-in.	5.30c.
⅜-in.	5.50c.
Rails	3.20c.
Swedish iron bars	6.60c.

*For 50 bundles or more: 10 to 49 bun., 4.10c. base: 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

for No. 13 gage, and blue annealed plates at 2.10c., base, Pittsburgh, or 2.42c., delivered Philadelphia, for No. 10 gage. Black sheets have developed some firmness and are quoted at 2.65c. per lb., Pittsburgh, or 2.97c., delivered Philadelphia, and galvanized sheets are quoted at 3.30c. per lb., Pittsburgh, or 3.92c., delivered Philadelphia. These prices apply on present business, which is generally limited to small lots, but no substantial orders to test their firmness have developed in this district.

Warehouse Business.—Jobbers have reduced the price of cold-finished steel from stock $2 a ton to 3.40c. per lb. for rounds and hexagons and 3.90c. per lb. for squares and flats, and have applied the cutting extras and quantity differentials recently adopted by warehouses in the New York district.

Imports.—In the week ended Feb. 8, a total of 1658 tons of chrome ore arrived at this port, of which 1050 tons was from Portuguese Africa and 608 tons from British South Africa. Arrivals of pig iron totaled 550 tons from British India, and 14 tons of ferrochrome was received from Switzerland. Steel imports included 205 tons of bars, of which 112 tons came from France, 37 tons from Sweden, 31 tons from Belgium and 25 tons from Germany. Sixty-two tons of structural shapes came from Belgium, 27 tons of hoop steel from Belgium, 7 tons of steel tubes, 4 tons of steel rods and 2 tons of iron bars from Sweden and 10 tons of galvanized strip steel from the United Kingdom.

Old Material.—All grades of scrap are quiet and prices are generally unchanged, except for slightly higher levels on certain small tonnages, such as $13.50 a ton on No. 2 heavy melting steel bought by an eastern Pennsylvania steel mill and $12.50 a ton for stove plate purchased by an eastern Pennsylvania user.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel.		$14.50
Scrap T rails		14.00
No. 2 heavy melting steel.	$12.00 to	13.00
No. 1 railroad wrought	15.00 to	15.50
Bundled sheets (for steel works)		11.50
Hydraulic compressed, new		13.00
Hydraulic compressed, old.	12.00 to	12.50
Machine shop turnings (for steel works)		11.00
Heavy axle turnings (or equiv.)	12.50 to	13.00
Cast borings (for steel works and roll. mill)		11.00
Heavy breakable cast (for steel works)	13.50 to	14.00
Railroad grate bars	11.00 to	11.50
Stove plate (for steel works)	11.50 to	12.50
No. 1 low phos., hvy., 0.04% and under	20.50 to	21.50
Couplers and knuckles	19.00 to	19.50
Rolled steel wheels	19.00 to	19.50
No. 1 blast f'nace scrap	10.50 to	11.00
Wrot. iron and soft steel pipes and tubes (new specific.)		14.00
Shafting		19.00
Steel axles	20.00 to	21.00
No. 1 forge fire	13.00 to	13.50
Cast iron carwheels		15.00
No. 1 cast	15.00 to	15.50
Cast borings (for chem. plant)	14.00 to	14.50
Steel rails for rolling	15.00 to	15.50

Bronze Alloys as Made in France

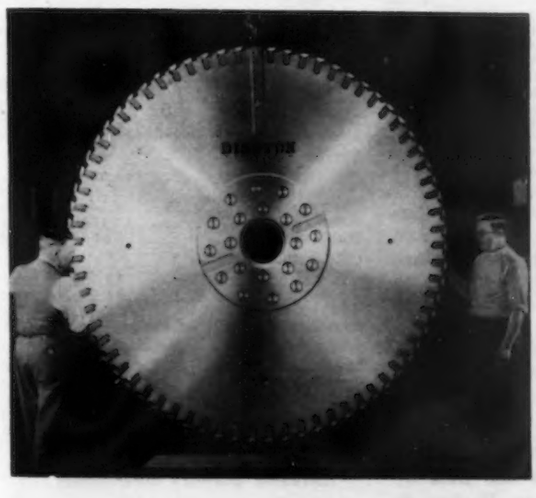
PARIS, Jan. 5.—Although bronze alloys were known about 24 centuries before the Christian era, the methods employed today, at any rate in France, differ but little from those employed in ancient times. Such is the opinion of L. Thibaut who, in the *Révue de Fonderie Moderne*, criticises severely his fellow countrymen engaged in its manufacture.

In France, bronze foundries are generally operated and owned by former workmen and are not equipped for intensive operation. Frequently they are installed hurriedly in a cellar or a shed with a view to immediate production. Therefore, should it be desired later to introduce modern methods, the most enthusiastic metallurgist is faced with extreme difficulties. As a rule the bronze worker in France is so much absorbed with the purchase of his raw material, with his customers, and with the keen competition now prevalent, that he has little time to devote to scientific research.

From the commercial point of view, these founders do not understand the principles which govern cost; thus a keen seller frequently finds himself confronted with competitive prices in which no provision has been made for overhead charges or for fluctuations in the market value of raw materials.

In the same journal L. Achard discusses the manufacture of bronze and emphasizes the importance of copper-aluminum alloys, especially in view of the high prices which govern the sale of tin. He gives briefly the analyses of ordinary bronzes containing from 90 to 67 per cent copper with varying quantities of tin, zinc and lead, but expresses the opinion that in the future copper-aluminum alloys will dominate the market, especially the type containing 90 per cent copper and 10 per cent aluminum which, in America, England and Germany, has been recognized as superior to the ordinary compositions. The difficulties of manufacture are both important and complex, and here France has again been slow in keeping abreast of other countries. Nevertheless there are a few firms specializing in this class of alloy in France who quote it at 15 to 20 francs per kilo, or about 30c. to 40c. per lb.

The advantages of the aluminum bronzes are: Suppression of tin; mechanical resistance and physical quality of steel, enabling gear wheels to last three and four times longer than when made of ordinary bronze; considerable resistance to wear, owing to the alloy maintaining a fine polish; high resistance to oxidation, thus replacing steel in many cases; resistance to hydrochloric, sulphuric and acetic acids; ease with which it can be forged and worked; a fine golden color, and a good polish.



GIANT metal-cutting saw, weighing approximately 1½ tons, 110 inches in diameter, and 15/16 inches thick, recently built by Henry Disston & Sons, Inc., Philadelphia, Pa. Midvale Co., Philadelphia, will use it to cut giant steel forgings

Iron and Steel Institute for South Africa

A movement has been started in Johannesburg to form an iron and steel institute, according to *Engineer*, London. The sponsors intend to form a committee to deal with propaganda for finding markets for the primary and secondary products of the iron and steel industry.

The institute will be formed on the lines of the iron and steel institutes of England and Scotland, and an executive has already been appointed to found it.

Manufacturing activities of the Delco-Light Co., Dayton, will be moved to Rochester, N. Y., within the next 90 days, to be housed at the North East Appliance Corporation factory, Lyell Avenue and Whitney Street. The Day-Fan Co., also of Dayton, a recently acquired General Motors Co. subsidiary, and maker of electric household appliances and electric fans and motors, will also be moved to Rochester, but the line of radio sets fabricated in the Dayton plant will continue to be made there, under the direction of the General Motors Co.

Pacific Coast

Considerable Construction Work in Sight, with Bids to Be Called for Shortly

SAN FRANCISCO, Feb. 8 (*By Air Mail*).—Considerable construction work is in sight, and it is expected that bids will be called for shortly on many of the projects. Demand is slowly increasing, and some fair-sized lots were booked this week. The price situation is becoming firmer, this being especially true of out-of-stock quotations on steel products.

Pig Iron.—Movement of foundry pig iron remains light. No change in prices is noted.

Prices per gross ton at San Francisco:

*Utah basic	$25.00 to $26.00
*Utah fdy., sil. 2.75 to 3.25	25.00 to 26.00
**Indian fdy., sil. 2.75 to 3.25	25.00 to 26.00

*Delivered San Francisco.
**Duty paid, f.o.b. cars San Francisco.

Bars.—A fair volume of reinforcing bar business was placed this week. The Soule Steel Co. secured 270 tons for a cannery at Richmond, Cal. The California State Highway Commission awarded the general contract on two projects involving 270 tons. Lots ranging from 30 to 70 tons continue to make up the bulk of the business booked. Prices are firm on out-of-stock material at 2.30c., base, on carload lots, and 2.60c., base, on smaller lots. Merchant bar prices are firm at 2.35c., c.i.f. cost ports. Demand for the latter class of material is not active.

Plates.—Plate business booked this week was in lots of less than 100 tons. Demand is exceptionally quiet, no large pipe line or tank tonnages being in sight. Quotations are general at 2.25c., c.i.f., but any desirable tonnage would no doubt bring out a lower price.

Shapes.—Structural steel bookings this week at 3500 tons were the second largest this year. Lettings included 450 tons for a bridge over the San Joaquin River at Stockton, Cal., for the Santa Fe Railroad, placed with the American Bridge Co.; 1000 tons for the Fourteenth Avenue South bridge, Seattle, booked by the Wallace Bridge & Structural Steel Co., and 200 tons for an apartment house on O'Farrel Street, San Francisco, taken by the Golden Gate Iron Works. Bids have been opened on 270 tons for a library in Berkeley and on 170 tons for an office building at Salinas, Cal. Plain material is firm at 2.35c., c.i.f. coast ports.

Cast Iron Pipe.—Bookings of cast iron pipe this week were fairly heavy, though pending business is light. The United States Pipe & Foundry Co. took 282 tons of 12-in. Class B pipe for the Santa Fe Irrigation District, Oceanside, Cal. Southgate Cal., placed 100 tons of 6 and 10-in. Class B pipe for Improvement Job No. 2., with Ed. Johnson & Sons. The Downey County Water Works District, Downey, Cal., awarded 1694 tons of 2 to 10-in. class B pipe with Lee R. Weber, Southgate, Cal. Los Angeles, under specification No. 1287, awarded 318 tons of 6-in. Class 150 pipe to the Pacific States Cast Iron Pipe Co., and 317 tons to the National Cast Iron Pipe Co. Bert Noble is low bidder on 135 tons of 6 to 12-in. Class B pipe for Tamarak Street, San Diego. Colfax, Wash., has opened bids on 196 tons of 6 to 10-in. Class B pipe.

Track Material.—The United States Steel Products Co. was low bidder on 500 tons of track equipment for the Oakland Port Commission. Included were 160 tons of 128-lb. girder rails and 140 tons of 90-lb. T rails. Frogs and switches, tie plates and track bolts and spikes were the other items.

Warehouse Prices, f.o.b. San Francisco

	Base per Lb.
Plates and struc. shapes	3.30c.
Soft steel bars	3.30c.
Small angles, ⅞-in. and over	3.15c.
Small angles, under ⅞-in.	3.55c.
Small channels and tees, ¾-in. to 2¾-in.	3.75c.
Spring steel, ¼-in. and thicker	5.00c.
Black sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.90c.
Galv. sheets (No. 24)	5.30c.
Struc. rivets, ½-in. and larger	5.65c.
Com. wire nails, base per keg	$3.40
Cement c't'd nails, 100 lb. keg	3.40

Boston

Pig Iron Prices Off 50c. a Ton Even on Small Sales—Scrap Dull and Weak

BOSTON, Feb. 10.—About 1500 tons of New York State pig iron was sold in New England the past week, but furnace representatives otherwise did very little business. The largest lot sold was 600 tons to a Vermont foundry. The General Fire Extinguisher Co., Providence, R. I., postponed its purchase of 1000 tons until this week. There is a possibility that the company will buy as much as 2000 or 2500 tons. No other important business is in sight. Sales of No. 2X Buffalo iron have been made at $16.50 a ton, furnace, such transactions having involved tonnages as small as car lots. Furnaces east of Buffalo are meeting this price.

Foundry iron prices per gross ton deliv'd to most New England points:

*Buffalo, sil. 1.75 to 2.25	$21.41 to $21.91
*Buffalo, sil. 2.25 to 2.75	21.41 to 21.91
East. Penn., sil. 1.75 to 2.25	22.65 to 23.15
East. Penn., sil. 2.25 to 2.75	23.15 to 23.65
Va., sil. 1.75 to 2.25	25.21
Va., sil. 2.25 to 2.75	25.71
*Ala., sil. 1.75 to 2.25	24.11
*Ala., sil. 2.25 to 2.75	24.61
†Ala., sil. 1.75 to 2.25	20.25
†Ala., sil. 2.25 to 2.75	20.75

Freight rates: $4.91 all rail from Buffalo; $3.65 all rail from eastern Pennsylvania; $5.21 all rail from Virginia; $9.61 all rail from Alabama and $5.75 rail and water from Alabama to New England seaboard.
*All rail rate.
†Rail and water rate.

Cast Iron Pipe.—Concord, N. H., is in the market for 250 tons of 6 to 12-in. pipe. North Reading, Mass., has tentative plans for buying pipe, and Middletown, Conn., will shortly place 16,000 ft. of 16 in. Open quotations are as follows: 4-in., $48.10 to $49.10 a ton, delivered common Boston freight rate points; 6 to 12-in., $44.10 to $45.10; larger dimensions, $43.10 to $44.10. A $4 differential is asked on Class A and gas pipe.

Structural Steel.—The Bethlehem Steel Co. was awarded 360 tons of steel required for three Boston & Maine Railroad bridges to be built between Boston and Concord, N. H. The Boston Bridge Works, Inc., will do the fabricating. A local bank addition, calling for close to 2000 tons of steel, will be let this week, and possibly two or three other sizable jobs.

Old Material.—Business in old material slowed up somewhat the past week, presumably because brokers have largely completed filling old orders, but also because steel mills are placing very little new business. With the slowing up in shipments has come some easing in prices for certain materials. Steel mill borings, blast furnace borings and turnings

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.365c.
Structural shapes—	
Angles and beams	3.365c.
Tees	3.365c.
Zees	3.465c.
Soft steel bars, small shapes	3.265c.
Flats, hot-rolled	4.15c.
Reinforcing bars	3.265c. to 3.54c.
Iron bars—	
Refined	3.265.c
Best refined	4.60c.
Norway rounds	6.60c.
Norway squares and flats	7.10c.
Spring steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tie steel	4.50c. to 4.75c.
Bands	4.015c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex	*3.55c. to 5.55c.
Squares and flats	*4.05c. to 7.05c.
Toe calk steel	6.00c.
Rivets, structural or boiler	4.50c.

	Per Cent Off List
Machine bolts	50 and 5
Carriage bolts	50 and 5
Lag screws	50 and 5
Hot-pressed nuts	50 and 5
Cold-punched nuts	50 and 5
Stove bolts	70 and 10

*Including quantity differentials.

and forge scrap are down 25c. a ton, and steel turnings are off 10c. The spread in prices paid for forge flashings is wider than usual, with the tendency downward. Chemical borings have dropped 50c. a ton because of the holding up of shipments by a New Jersey consumer. No. 1 heavy melting steel is steady because the available supply is comparatively small. One broker is reported to have paid more than $11 a ton, on cars shipping point, but most of the brokers are holding to $11, or less.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel	$10.50 to $11.00
Scrap T rails	10.25 to 10.50
Scrap girder rails	9.00 to 9.50
No. 1 railroad wrought	10.50 to 11.00
No. 1 yard wrought	9.50 to 10.00
Machine shop turnings	6.00 to 6.50
Cast iron borings (steel works and rolling mill)	6.00 to 6.50
Bundled skeleton, long	8.50 to 9.25
Forge flashings	8.50 to 9.25
Blast furnace borings and turnings	5.75 to 6.00
Forge scrap	8.00 to 8.50
Shafting	14.00 to 14.50
Steel car axles	15.50 to 16.50
Wrought pipe 1 in. in diameter (over 2 ft. long)	9.00 to 9.50
Rails for rolling	10.50 to 10.75
Cast iron borings, chemical	8.50 to 9.00

Prices per gross ton deliv'd consumers' yards:

Textile cast	$13.50 to $14.00
No. 1 machinery cast	15.00 to 15.25
No. 2 machinery cast	14.00 to 14.50
Stove plate	10.50 to 11.00
Railroad malleable	17.00 to 17.50

level, with seven stacks blowing. Prices are firm, but unchanged.

Prices per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75	$23.60
No. 2 fdy., sil. 1.75 to 2.25	23.10
Malleable	23.60
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	$25.00
No. 2 fdy., sil. 1.75 to 2.25	24.50
Malleable	25.00
Basic	23.50
Imported Iron, Montreal Warehouse	
Summerlee	$33.50
Carron	33.00

Structural Steel.—The demand has not yet reached the high point expected by fabricators, but there is a steady flow of small orders, and all plants are running full time. It is estimated that about 25,000 tons is pending for early closing. Among the pending projects slated for early closing is 5000 tons for the Canadian Life Assurance Building, Toronto.

Old Material.—Following better conditions in the iron and steel industry as a whole, improved demand for iron and steel scrap is reported by Toronto and Montreal dealers. The recent revision of prices has also tended to strengthen confidence in the market, and some consumers who have been withholding contracts and orders are now buying.

Dealers' buying prices:

	Per Gross Ton	
	Toronto	Montreal
Heavy melting steel	$9.00	$8.00
Rails, scrap	11.00	9.00
No. 1 wrought	9.00	11.00
Machine shop turnings	7.00	6.00
Boiler plate	7.00	6.50
Heavy axle turnings	7.50	6.50
Cast borings	6.50	5.00
Steel borings	6.50	6.00
Wrought pipe	6.00	6.00
Steel axles	14.00	17.00
Axles, wrought iron	16.00	19.00
No. 1 machinery cast	....	16.00
Stove plate	....	12.00
Standard carwheels	....	14.50
Malleable	....	13.00
Per Net Ton		
No. 1 mach'ry cast	$15.00	....
Stove plate	11.00	....
Standard carwheels	14.00	....
Malleable scrap	11.00	....

Canada

Improved Buying of Pig Iron and Scrap

TORONTO, ONT., Feb. 10.—According to local blast furnace representatives, the demand for merchant pig iron is forging ahead now at a fairly rapid pace. While little forward delivery contracting is being done, general improvement has developed in the demand for prompt shipment iron. Sales in the week were more numerous and individual tonnages were larger than in previous weeks this year. The melt is being stepped up by companies which shared in recent railroad equipment orders, and there is also improvement in operations of radiator makers. Pig iron production is sustained at a good

Youngstown

Steel Specifications This Month Are Holding to January Average, with Production Rates Maintained

YOUNGSTOWN, Feb. 10.—Valley steel interests are well satisfied that specifications thus far this month are maintaining the January average, even though improvement has not been marked in the last 10 days. Although business in general has been improving steadily since the first of the year, the mills in the Youngstown district attaining the largest increases in operations are those which have benefited most from automotive demand. The fact that the larger makers of automobiles in the low and medium-price class are still increasing their production gives Valley sheet and strip mills considerable assurance for a well-sustained operating rate.

The increase in pipe operations has not been pronounced, but the leading makers are running at 60 to 65 per cent of capacity, which is considered normally good for this season of the year. In some cases, this production is hardly justified by actual orders, as some sizes of pipe can safely be produced for stock and quickly moved when the season begins. Tin plate operations are at about 75 per cent, and improving gradually. Bar mills average 65 per cent, with independent companies possibly running at a slightly higher rate than the leading interest.

Valley steel companies are still somewhat concerned over the price situation, particularly on the flat-rolled steel products. Prices are holding satisfactorily in the immediate Valley district, but concessions in the Detroit market continue to be a disturbing factor, and some very large tonnages have been placed in the last two or three weeks at prices definitely under the quoted schedules. Some of these orders will be shipped against until the end of the quarter, and, unless steel demand has reached capacity proportions by that time, it may be difficult to secure better prices on second quarter business. Black sheets, which are generally quoted by Youngstown companies at 2.65c., still lack strength, and on galvanized material little business is now going at more than 3.30c. Although most mills are reluctant to give large jobbers a $2 differential, this has been done on some business. Light plates and blue annealed sheets from jobbing mills are holding fairly well at 2.10c. and 2.25c. for the Nos. 10 and 13 gage respectively, but the continuous mill product has been sold at as low as 1.90c. and 2.05c. Shading of metal furniture sheet prices is reported in exceptional cases, although leading makers continue to quote 4c. flat. Hot-rolled strip prices are by no means firm, having settled generally to 1.90c., Pittsburgh, for 6-in. mate-

Enameled and Galvanized Sheet-Metal Ware

Sheet-Metal Ware:	December, 1929	November, 1929	December, 1928
Enameled. Shipments(a), dozens	391,523	305,714	324,445
do. do., value	$1,160,801	$1,257,935	$1,104,060
do. do., 12 months, dozens	4,504,102	.....	4,191,761
do. do. do., value	$16,101,858	.....	$15,787,496
Galvanized, do. (a), dozens	107,733	90,684	.....
do. do., value	$286,724	$299,147	.....
do. do., 12 months, dozens	1,647,272	.....	1,763,401
do. do. do., value	$5,223,523	.....	$5,736,682
do. production, do., dozens	1,624,811	.....	1,795,625

(a) United States Department of Commerce.

rial and narrower, and 1.80c. for the wider sizes. On cold-rolled material 2.65c., Pittsburgh or Cleveland, is the ruling quotation, but this is subject to considerable pressure on account of the poor demand for cold-rolled material. Bars are quotable at 1.85c. to 1.90c., with the bulk of the tonnage going at the lower figure. Billets, slabs and sheet bars are now generally available at $33, Youngstown, but spot sales are negligible.

Steel ingot production in the Valleys is maintaining the heavy increases of the last few weeks. The Republic Iron & Steel Co. last week operated 21 of 23 available open-hearth furnaces, while the Youngstown Sheet & Tube Co. has 15 of its 24 furnaces in operation, and a larger number will probably be running this week. The smaller non-integrated companies average 75 to 80 per cent of capacity in their various departments, with sheet mills probably maintaining the best rate.

The pig iron market continues rather dull, although four of the six merchant stacks in the Valley district are now active. No recent gain in steel-making stacks is reported. Pig iron prices are unchanged at $18.50, Valleys, for foundry and basic, and $19 for Bessemer and malleable. The basic price has not been tested recently on any considerable tonnage, but small lots of the other grades are being sold regularly at the full schedules.

The scrap market is rather strong, with No. 1 heavy melting steel quotable at $16.50, and hydraulic compressed sheets at about 25c. less. Recent small railroad lists which have gone to Valley mills have brought somewhat higher prices.

Cast Iron Pipe.—Municipal inquiries, together with other projects known to be pending, point to active buying again by the end of February and during March. Practically no pipe has been ordered yet for delivery for the usual spring and summer construction programs by cities. Plants are operating on fair backlogs as a result of recent contracting by utilities and the several good tonnages sold to Pacific Coast points. Prices remain firm at $37 to $38 a ton, Birmingham, for 6-in. and larger sizes.

Coke.—Shipments of foundry coke are steady, but the movement as a whole is hardly averaging as well as at this season last year. Prices are unchanged at $5 a net ton, Birmingham.

Old Material.—Large melters of steel scrap are not taking heavy shipments. The unchanged quotations represent nominal values.

Prices per gross ton, deliv'd Birmingham dist. consumers' yards:

Heavy melting steel	$13.00 to	$13.50
Scrap steel rails		14.00
Short shoveling turnings		9.00
Cast iron borings		9.00
Stove plate	11.50 to	12.00
Steel axles		22.00
Iron axles		23.00
No. 1 railroad wrought	10.00 to	10.50
Rails for rolling		15.50
No. 1 cast		13.00
Tramcar wheels		12.50
Cast iron carwheels	13.00 to	13.50
Cast iron borings, chem.	13.50 to	14.00

Birmingham

Pig Iron Demand Shows a Slight Improvement—New Business in Steel Developing Steadily

BIRMINGHAM, Feb. 10.—Demand is growing a little stronger in the pig iron market, as melters use up the balance of the iron coming to them on the fourth quarter contracts. Sales during the remainder of the quarter are expected to be heavier than those in the first half of the quarter. Melters are buying only for their immediate requirements, but shipments have shown some improvement, and, in one or two instances, furnaces have drawn on their yard stocks to supply the calls from the trade for prompt shipments. Although concessions are being given on sales to consumers in the Northern States, quotations in the district are said to be firm at $15, base. The No. 3 North Birmingham furnace of the Sloss-Sheffield Steel & Iron Co. was blown in Feb. 3 on foundry iron, making a total of 17 active furnaces in the district, of which 10 are on foundry iron, six on basic and one on recarburizing iron.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	$14.50 to $15.00
No. 1 fdy., 2.25 to 2.75 sil.	15.00 to 15.50
Basic	14.50 to 15.00

Finished Steel.—New business continues to develop at the steady rate of the past three or four weeks. Bookings of bars, plates, shapes, sheets and railroad accessories have been close to the unusually high total of the corresponding period last year. Sales of sheets have held up much better this quarter than in the comparable periods in previous years. Prospects for more railroad buying add to the favorable outlook of the market for the near future. Minimum quotations on galvanized sheets have been reduced $1 a ton to 3.45c. All other prices are the same. Demand for fabricated structural steel has been strong this month. The Ingalls Iron Works Co. booked an order last week for 1100 tons for an addition to the First National Bank Building at Atlanta. Reinforcing bar manufacturers report increasing demand, coming from road and bridge and other public construction work. Active open-hearths total 18, the same as last week.

Cincinnati

Pig Iron Sales 8100 Tons—Weakness in Southern Prices—Demand for Sheet Steel Holding Up Well

CINCINNATI, Feb. 10.—Demand for pig iron took another spurt, and district furnace representatives experienced the best week so far this year. Total sales of pig iron were about 8100 tons, of which only 680 tons went to Southern furnaces. This sudden increase of demand in the middle of a quarter indicates well the policy of buyers. They are taking material only as needs arise and then only for a 30-day coverage. While all of the Northern iron was said to have been sold at full prices, the Southern went at quotations ranging from $13.50 to $14.50, base Birmingham. It now appears certain that Southern iron may be bought readily at about $13.50, base Birmingham. An Indiana consumer took 3000 tons of malleable iron. Another Indiana melter bought 400 tons of Northern foundry iron, and two Ohio consumers took 500 tons each. A Michigan buyer took 400 tons.

Prices per gross ton, deliv'd Cincinnati:

So. Ohio fdy., sil. 1.75 to 2.25	$19.89 to $20.39
Ala. fdy., sil. 1.75 to 2.25	17.19 to 18.19
Ala. fdy., sil. 2.25 to 2.75	17.69 to 18.69
Tenn. fdy., sil. 1.75 to 2.25	17.69 to 18.19
S'th'n Ohio silvery, 8 per cent	26.89

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.69 from Birmingham.

Finished Steel.—Orders for sheets are characterized by their large number and the frequent demands for prompt shipment. Although the volume of business booked by a leading sheet producer in the past week was not above 85 per cent of capacity production, mill schedules are being stepped up to meet the delivery requirements of buyers. This producer has a two weeks' backlog. Buyers

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes	3.40c.
Bars, soft steel or iron	3.30c.
New billet reinforc. bars	3.15c.
Rail steel reinforc. bars	3.00c.
Hoops	4.05c.
Bands	3.50c.
Cold-fin. rounds and hex.	3.85c.
Squares	4.35c.
Black sheets (No. 24)	4.05c.
Galvanized sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.45c.
Structural rivets	4.20c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg	2.85
Cement c't'd nails, base 100 lb. keg	2.85
Chain, per 100 lb.	10.25
	Net per 100 Ft.
Lap-welded steel boiler tubes, 2-in.	$16.50
4-in.	34.50
Seamless steel boiler tubes, 2-in.	17.50
4-in.	36.00

are restricting their inquiries and orders to about 30 days' requirements. A southern Ohio company is in the market for 600 tons of black sheets for highway markers. Believing that sheet prices have reached their lowest point and may become slightly firmer, producers are urging customers to cover their known requirements at once.

Old Material.—The slight strengthening of the old material market in other areas is reflected here, and dealers were bidding 25c. more on heavy melting steel and No. 2 wrought than a week ago. Mills are accepting shipments on old contracts, and as these run out renewals are being made quietly. The Norfolk & Western, the Chesapeake & Ohio and the Southern Railway are offering their usual lists, on which bids will close this week.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel	$12.50 to $13.00
Scrap rails for melting	13.00 to 13.50
Loose sheet clippings	8.00 to 8.50
Bundled sheets	10.75 to 11.25
Cast iron borings	8.50 to 9.00
Machine shop turnings	8.25 to 8.75
No. 1 busheling	10.00 to 10.50
No. 2 busheling	6.50 to 7.00
Rails for rolling	13.50 to 14.00
No. 1 locomotive tires	14.25 to 14.75
No. 2 railroad wrought	12.75 to 13.25
Short rails	17.50 to 18.00
Cast iron carwheels	12.00 to 12.50
No. 1 machinery cast	18.50 to 19.00
No. 1 railroad cast	15.00 to 15.50
Burnt cast	10.00 to 10.50
Stove plate	10.00 to 10.50
Brake shoes	10.00 to 10.50
Agricultural malleable	14.00 to 14.50
Railroad malleable	15.00 to 15.50

charge the material direct from the cars, thus saving handling costs; otherwise, there is no incentive to buy. However, because of the reserves, the mills are holding prices down, and are buying cautiously, with dealers proceeding in the same manner and accepting as little business as possible at present levels. There has been a free movement of material into this market both from country dealers and the railroads. Prices are unchanged. Railroad lists include: Wabash, 2970 tons; Missouri-Kansas-Texas, 1300 tons; Kansas City Southern, 150 tons; Ann Arbor, 100 tons; Great Northern, 50 carloads; Chicago & Eastern Illinois, 12 carloads.

Dealers' buying prices per gross ton, f.o.b. St. Louis district:

No. 1 heavy melting or shoveling steel	$12.50 to $13.00
No. 2 heavy melting or shoveling steel	11.75 to 12.25
No. 1 locomotive tires	14.50 to 15.00
Misc. stand.-sec. rails including frogs, switches and guards, cut apart	13.50 to 14.00
Railroad springs	15.50 to 16.00
Bundled sheets	9.50 to 10.00
No. 2 railroad wrought	12.50 to 13.00
No. 1 busheling	9.75 to 10.25
Cast iron borings and shoveling turnings	9.25 to 9.75
Iron rails	13.00 to 13.50
Rails for rolling	14.50 to 15.00
Machine shop turnings	6.75 to 7.25
Heavy turnings	9.00 to 9.50
Steel car axles	19.50 to 20.00
Iron car axles	26.00 to 26.50
Wrot. iron bars and trans.	21.50 to 22.00
No. 1 railroad wrought	13.00 to 13.50
Steel rails, less than 3 ft.	17.00 to 17.50
Steel angle bars	14.00 to 14.50
Cast iron carwheels	14.00 to 14.50
No. 1 machinery cast	15.25 to 15.75
Railroad malleable	14.00 to 14.50
No. 1 railroad cast	14.00 to 14.50
Stove plate	11.75 to 12.25
Relay. rails 60 lb. and under	20.50 to 23.50
Relay. rails 70 lb. and over	26.50 to 29.00
Agricult. malleable	13.00 to 13.50

St. Louis

Southern Pig Iron Makers Are Campaigning for Northern Business—Steel Buying in January Above Shipments

ST. LOUIS, Feb. 10.—Southern makers continue their campaign for pig iron business in the North on the basis of $13 to $13.50, Birmingham, and are cutting in on the sales of Northern makers. The St. Louis Gas & Coke Corporation sold during the week approximately 7000 tons, of which 2500 tons, the largest individual order, came from a manufacturer of heating appliances. An improvement in the melt is reported. Implement manufacturers are extremely busy.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	$19.50 to $20.00
Malleable, f.o.b. Granite City	20.00
N'th'n No. 2 fdy., deliv'd St. Louis	22.16
Southern No. 2 fdy., deliv'd	17.42 to 18.42
Northern malleable, deliv'd	22.16
Northern basic, deliv'd	22.16

Freight rates: 75c. (average) Granite City to St. Louis: $2.16 from Chicago: $4.42 from Birmingham.

Finished Steel.—Incoming business of the Granite City Steel Co. for January was reported to be in excess of that for December, and, for the first time in months, sales were larger than shipments. With the exception of tin plate, for which there is a good demand, business in February has slowed up. Warehouse business has been fair. The first building project of size to materialize this year is a toll building for the Southwestern Bell Telephone Co., calling for 1000 tons of structural steel.

Old Material.—With large reserve stocks on hand, mills in the St. Louis district are buying only for quick shipments that will enable them to

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
Cold-fin. rounds, shafting, screw stock	3.75c.
Black sheets (No. 24)	4.25c.
Galv. sheets (No. 24)	4.85c.
Blue ann'l'd sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	4.30c.
Galv. corrug. sheets	4.90c.
Structural rivets	4.15c.
Boiler rivets	4.15c.
	Per Cent Off List
Tank rivets, ⅞-in. and smaller, 100 lb. or more	65
Less than 100 lb.	60
Machine bolts	60
Carriage bolts	60
Lag screws	60
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	60
Less than 200 lb.	50
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	60
Less than 200 lb.	50

Buffalo

Steel Plant Operations Gain—Pig Iron Bookings Light but Shipments Are Steady—Scrap Firmer

BUFFALO, Feb. 10.—Pig iron bookings in this district during the past week totaled about 5000 tons, consisting principally of small lots. Producers report a better tone in the market and some pressure for prompt shipment on old orders. One inquiry from eastern Pennsylvania is for 500 tons of foundry, and a Rhode Island melter is in the market for 500 tons of foundry. One of the largest orders taken by a Buffalo furnace was for 500 tons of foundry. No sales have been made for the second quarter, though considerable of the iron taken during the first quarter will drag over to the second period. The district price is holding firm at $18, base Buffalo, with most of the furnaces adhering to $17, Buffalo, on New England business, although some shading of this price has been noted.

Prices per gross ton f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25	$18.50
No. 2X fdy., sil. 2.25 to 2.75	19.00
No. 1 fdy., sil. 2.75 to 3.25	20.00
Malleable, sil. up to 2.25	19.00
Basic	17.00
Lake Superior charcoal	27.28

Finished Steel.—Operations of Buffalo steel mills are somewhat im-

Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes	3.40c.
Soft steel bars	3.30c.
Reinforcing bars	2.95c
Cold-fin. flats, sq. and hex.	4.45c.
Rounds	3.95c.
Cold-rolled strip steel	5.85c.
Black sheets (No. 24)	4.20c.
Galv. sheets (No. 24)	4.85c.
Blue ann'l'd sheets (No. 10)	3.50c.
Com. wire nails, base per keg	$3.35
Black wire, base per 100 lb.	3.45

proved. The Lackawanna plant of the Bethlehem Steel Co. is operating 19 of its 24 open-hearths, with most of its mills on double turn. The Donner Steel Co. is operating four open-hearths. The Wickwire-Spencer plant is at 75 per cent of capacity, and the Seneca Iron & Steel Co. is close to that mark. More inquiries are coming out for reinforcing bars, one of 300 tons and another of 185 tons for Buffalo schools being reported. The arch bridge over the Genesee River at the Ridge Road, Rochester, will require 500 tons of structural steel, in addition to 2000 tons of bars.

Old Material.—Current business is confined to sales of small lots. It is reported that most of the scrap on the Michigan Central list will come to Buffalo. The price paid for the No. 1 heavy melting steel is said to be $15.02. A large local consumer of steel scrap is understood to be willing to pay $14 for No. 1 steel and $12.50 for No. 2, but it is not believed to have obtained any tonnage at these figures. Dealers have been paying up to $14.75 to fill orders taken some weeks ago at $14.50.

Prices per gross ton f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$14.50 to $14.75
No. 2 heavy melting scrap	12.50
Scrap rails	14.75 to 15.25
Hydraul. comp. sheets	12.50
Hand bundled sheets	10.50 to 11.00
Drop forge flashings	12.50
No. 1 busheling	13.00 to 13.75
Hvy. steel axle turnings	13.50 to 14.00
Machine shop turnings	9.50 to 10.00
No. 1 railroad wrought	11.00 to 11.50
Acid Open-Hearth Grades:	
Knuckles and couplers	18.00 to 19.00
Coil and leaf springs	18.00 to 19.00
Rolled steel wheels	18.00 to 18.50
Low phos. billet and bloom ends	18.00 to 19.00
Electric Furnace Grades:	
Short shov. steel turnings	12.50 to 13.00
Blast Furnace Grades:	
Short mixed borings and turnings	10.75 to 11.25
Cast iron borings	10.75 to 11.25
No. 2 busheling	8.00
Rolling Mill Grades:	
Steel car axles	17.00 to 17.50
Iron axles	20.00 to 21.00
Cupola Grades:	
No. 1 machinery cast	14.50 to 15.00
Stove plate	12.50 to 12.75
Locomotive grate bars	10.50 to 11.00
Steel rails, 3 ft. and under	17.50 to 18.00
Cast iron carwheels	12.00 to 12.50
Malleable Grades:	
Industrial	16.50 to 17.00
Railroad	16.50 to 17.00
Agricultural	16.50 to 17.00
Special Grades:	
Chemical borings	12.00 to 12.50

The Atlas Car & Mfg. Co., Cleveland, has appointed Goggin & Mills, 5 South Wabash Avenue, Chicago, as Chicago representative for the sale of industrial storage battery and trolley locomotives, storage battery trucks and tractors, industrial cars, track and turntables and other industrial equipment.

Ohio Brass Co., Mansfield, Ohio, had the most profitable year in its history in 1929 during which its net earnings were $2,823,057 or $7.78 a share on the common stock after preferred dividends.

Reinforcing Steel

Awards of 1100 Tons—New Projects Call for 1300 Tons

NEW YORK, 129 tons, Washington Bridge over Harlem River, to Kalman Steel Co.

CHICAGO, 800 tons, building at Harrison Street and Wabash Avenue to Olney J. Dean & Co.; previously reported to an unnamed bidder.

RICHMOND, CAL., 273 tons, cannery to Soule Steel Co.

OAKLAND, 100 tons, hotel, Fourteeth and Jackson Streets, to unnamed bidder.

SACRAMENTO, 250 tons, highway work in San Luis Obispo County, to unnamed bidder.

SACRAMENTO, 119 tons, highway work in Santa Barbara County, to unnamed bidder.

LOS ANGELES, 100 tons, office building, 5451 Marathon Street, to unnamed bidder.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

NEWARK, 600 tons, Haynes Avenue bridge; Joseph Speers Co., general contractor.

BUFFALO, 485 tons, school No. 82, 300 tons; school No. 44, 185 tons.

ROCHESTER, N. Y., 2000 tons, Ridge Road bridge; Booth & Flinn, Inc., general contractor.

PITTSBURGH, 200 tons, West End-North Side bridge; Foundation Co., general contractor.

PITTSBURGH, 600 tons, Ohio River Boulevard; Vang Construction Co., general contractor.

Railroad Equipment

Erie Orders 2150 Cars—Nickel Plate to Buy 2500

THE Van Sweringen roads have bought 13,500 freight cars. In addition to orders placed last week for 11,350 cars, distribution of which is given below, purchases of 2150 cars have been made for the Erie. An inquiry for 2500 cars for the Nickel Plate, another Van Sweringen line, is expected shortly.

The New York Central, Boston & Albany division, has bought 15 locomotives. Details of the week's business follow:

The Van Sweringen interests have placed orders for 13,500 freight cars as follows: For Chesapeake & Ohio, 1500 70-ton hopper cars and 1500 box cars to Standard Steel Car Co., 1500 50-ton gondola cars to American Car & Foundry Co., 500 box cars to Pressed Steel Car Co.; for Pere Marquette, 1500 40-ton automobile cars to Pullman Car & Mfg. Corporation, 1500 50-ton box cars to Standard Steel Car Co., 750 50-ton gondola cars to Ralston Steel car Co., 500 40-ton automobile and 250 40-ton furniture cars to Pressed Steel Car Co., 100 flat cars to Bethlehem Steel Co., 250 70-ton gondola cars to Greenville Steel Car Co.; for Hocking Valley, 1500 box cars to Standard Steel Car Co.; for Erie, 800 hopper cars to Standard Steel Car Co., 100 automobile and 100 furniture cars to Pressed Steel Car Co., 450 gondola cars to Greenville Steel Car Co., 500 box and 200 automobile cars to American Car & Foundry Co.

Boston & Albany has placed 10 freight locomotives with Lima Locomotive Works, and five passenger locomotives with American Locomotive Co.; delivery in April-May.

Louisville & Nashville is inquiring for six 4-8-2 type locomotive.

Georgia, Ashburn, Sylvester & Camilla is inquiring for one 2-8-2 type locomotive.

Nickel Plate is expected to be in the market soon for 2500 freight cars.

American Refrigerator Transit Co., which is inquiring for 1000 refrigerator cars may buy 2000.

Steel Corporation's Orders Gain 51,517 Tons

For the fifth month in succession unfilled orders of the United States Steel Corporation showed a gain. In January the increase was 51,517 tons, comparing with one of 291,848 tons in December and 38,783 tons in November. In October and September the gains were 183,981 tons and 244,370 tons respectively. The total on Jan. 31 was 4,468,710 tons, contrasting with 4,417,193 tons on Dec. 31. A year ago the unfilled orders were 4,109,487 tons.

Unfilled tonnage at the end of each month for the past two years follows:

	1930	1929	1928
January	4,468,710	4,109,487	4,275,947
December	.....	4,417,193	3,976,712
November	.....	4,125,345	3,673,000
October	.....	4,086,562	3,751,030
September	.....	3,902,581	3,698,368
August	.....	3,658,211	3,624,043
July	.....	4,088,177	3,570,927
June	.....	4,256,910	3,637,000
May	.....	4,304,167	3,416,822
April	.....	4,427,763	3,872,133
March	.....	4,410,718	4,335,206
February	.....	4,144,341	4,398,189

The orders on Jan. 31, this year, were larger than in the previous three Januarys.

Chandlers Form Company to Make Cap Screws

The Chandler Products Corporation, formed recently in Cleveland by interests formerly identified with the Chandler Motors Corporation and C. E. Needham, formerly sales engineer with the Cleveland Cap Screw Co., has broken ground on Chardon Road, Cleveland, for a new plant for the manufacture of Chandler cap screws.

Officers of the company are F. C. Chandler, Jr., president; C. E. Needham, vice-president, and I. Grossman, secretary. The officers and W. H. Chandler and J. V. Whitbeck form the board of directors.

The organization brings together men with nearly 30 years of experience in automobile building and 23 years of experience in fine thread making.

Especially designed equipment has been ordered for the new plant, and it is said that the new Chandler cap screw will be produced entirely automatically by methods entirely new to the industry. Production is scheduled to start April 15. A feature of the company's policy is that cap screws will be made of the materials specified by the customer, but by the Chandler method.

Non-Ferrous Metal Markets

Copper More Active—Tin Dull — Lead Steady — Zinc Easier

NEW YORK, Feb. 10.

Copper.—A gradually strengthening market has developed. Sales to both domestic and foreign consumers have increased. Sales abroad thus far this month amount to more than 12,000 tons, which is larger than for the same period in January. Domestic consumers have bought more thus far this month than for an equal period in January, though their orders have been for practically immediate shipment. The fact, however, that such orders are coming in more frequently than a week or so ago is considered significant. Since the announcement of a large consumer a week ago that its January business was 80 per cent of the average for 1929, other fabricators have made statements to producers of a similar nature. Producers state that they have every reason to feel encouraged and look for a gradually increasing volume of orders. Prices continue exceedingly firm, with electrolytic copper quoted at 18c., delivered in the Connecticut Valley. Copper Exporters, Inc., continues to quote 18.30c., c.i.f. usual European ports. Lake copper is fairly active at unchanged levels of 18c. to 18.12½c., delivered.

Tin.—Sales of Straits tin continue in small volume, the total for the week having been only 300 tons, all contracted for on Feb. 5, the only active day. Consumers still remain practically out of the market and there is no interest in the metal at present prices. Conditions have not changed from those prevailing a week ago. Price fluctuations have been very narrow and spot Straits tin, which is more or less nominal, is quoted at 38.87½c., New York. Quotations in London today were nearly the same as those on Feb. 4, with spot Standard quoted at £175 5s., future standard at £178 2s. 6d., and spot Straits at £177 7s. 6d. The Singapore price today was £180 10s.

Lead.—Demand is moderate and confined largely to carload lots for early delivery. While not much March metal has been contracted for, demand for this is expected to develop soon, resulting in a more active market. Buyers would be willing to contract further into the future but sellers are not willing to commit themselves. Prices are steady and unchanged at 6.10c., St. Louis. The quotation of the

THE WEEK'S PRICES. CENTS PER POUND FOR EARLY DELIVERY

	Feb. 10	Feb. 8	Feb. 7	Feb. 6	Feb. 5
Lake copper, New York	18.12½	18.12½	18.12½	18.12½	18.12½
Electrolytic copper, N. Y.*	17.75	17.75	17.75	17.75	17.75
Straits tin, spot, N. Y.	38.87½	....	39.00	39.12½	38.75
Zinc, East St. Louis	5.20	5.20	5.20	5.25	5.25
Zinc, New York	5.55	5.55	5.55	5.60	5.60
Lead, St. Louis	6.10	6.10	6.10	6.10	6.10
Lead, New York	6.25	6.25	6.25	6.25	6.25

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.

Rolled Products

List Prices, Per Lb., f.o.b. Mill

On Copper and Brass Products, Freight up to 75c. per 100 Lb. Allowed on Shipments of 500 Lb. or Over

Sheets—
- High brass ..... 23.25c.
- Copper, hot rolled ..... 26.75c.
- Zinc ..... 10.50c.
- Lead (full sheets) ..... 10.00c.

Seamless Tubes—
- High brass ..... 28.25c.
- Copper ..... 29.25c.

Rods—
- High brass ..... 21.25c.
- Naval brass ..... 24.00c.

Wire—
- Copper ..... 19.87½c.
- High brass ..... 23.75c.

Copper in Rolls ..... 26.75c.
Brazed Brass Tubing ..... 30.87½c.

Aluminum Products in Ton Lots

The carload freight rate is allowed to destinations east of Mississippi River and also to St. Louis on shipments to points west of that river.

- Sheets, 0 to 10 gage, 3 to 30 in. wide ..... 33.00c.
- Tubes, base ..... 42.00c.
- Machine rods ..... 34.00c.

Chicago Warehouse

(Prices Cover Trucking to Customers' Doors in City Limits)

Sheets—	Base per Lb.
High brass	23.25c.
Copper, hot rolled	27.75c.
Copper, cold rolled, 14 oz. and heavier	30.00c.
Zinc	10.75c.
Lead, wide	10.30c.
Seamless Tubes—	
Brass	28.25c.
Copper	29.25c.
Brass Rods	21.25c.
Brazed Brass Tubes	31.00c.

New York or Cleveland Warehouse

Delivered Prices, Base per Lb.

High brass	21.12½c.	to 22.12½c.
Copper, hot rolled, base sizes	27.75c.	to 28.75c.
Copper, cold rolled, 14 oz. and heavier, base sizes	30.00c.	to 31.00c.
Seamless Tubes—		
Brass	26.00c.	to 27.00c.
Copper	29.12½c.	to 30.12½c.
Brass Rods	18.87½c.	to 19.87½c.
Brazed Brass Tubes	29.12½c.	to 30.12½c.

New York Warehouse

Delivered Prices, Base per Lb.

- *Zinc sheets (No. 9), casks* ..... 10.75c. to 11.25c.
- *Zinc sheets, open* ..... 11.50c. to 12.00c.

Metals from New York Warehouse

Delivered Prices, Per Lb.

Tin, Straits pig	40.25c. to 41.25c.
Tin, bar	42.25c. to 43.25c.
Copper, Lake	19.50c.
Copper, electrolytic	19.25c.
Copper, casting	19.00c.
Zinc, slab	6.50c. to 7.50c.
Lead, American pig	7.00c. to 7.50c.
Lead, bar	9.00c. to 9.50c.
Antimony, Asiatic	10.50c. to 11.00c.
Aluminum No. 1 ingots for remelting (guaranteed over 99% pure)	25.00c. to 26.00c.
Alum. ingots, No. 12 alloy	24.00c. to 25.00c.
Babbitt metal, commercial grade	25.00c. to 35.00c.
Solder, ½ and ½	26.75c. to 27.75c.

Metals from Cleveland Warehouse

Delivered Prices, Per Lb.

Tin, Straits pig	44.25c.
Tin, bar	46.25c.
Copper, Lake	19.50c.
Copper, electrolytic	19.25c.
Copper, casting	18.75c.
Zinc, slab	7.75c. to 8.00c.
Lead, American pig	7.00c. to 7.20c.
Lead, bar	9.25c.
Antimony, Asiatic	16.00c.
Babbitt metal, medium grade	18.00c.
Babbitt metal, high grade	47.25c.
Solder, ½ and ½	28.50c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged consumers after the metal has been properly prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	14.75c.	16.25c.
Copper, hvy. and wire	14.50c.	16.00c.
Copper, light and bottoms	12.50c.	13.75c.
Brass, heavy	8.00c.	9.25c.
Brass, light	6.75c.	7.75c.
Hvy. machine composition	11.25c.	12.25c.
No. 1 yel. brass turnings	9.00c.	9.50c.
No. 1 red brass or compos. turnings	10.50c.	11.75c.
Lead, heavy	4.75c.	5.25c.
Lead, tea	3.75c.	4.25c.
Zinc	2.75c.	3.25c.
Sheet aluminum	11.00c.	13.00c.
Cast aluminum	10.00c.	12.00c.

leading interest is unchanged at 6.25c., New York.

Zinc.—Another week of inactivity is reported. The effect of the heavy buying movement at the lower levels prevailing several weeks ago is still in force and consumers are remaining largely out of the market. Prices have softened a little and prime Western zinc can be bought at concessions from 5.25c., East St. Louis, down to 5.22½c. or 5.20c. There is, however, no fair test of prices. Ore values have definitely advanced to $37, Joplin. Production and shipments were small last week at 6000 to 7000 tons each, and the surplus stocks are not materially changed.

Antimony.—Conditions are unchanged and the market is quiet, with Chinese metal for spot delivery quoted at 8.75c., with March at 8.62½c., New York, duty paid. Because of tariff uncertainties, far future deliveries are subject to special negotiation.

Nickel.—Wholesale lots of ingot nickel are quoted at 35c. a lb., with shot nickel at 36c. and electrolytic nickel in cathodes at 35c.

Aluminum.—Virgin metal, 98 to 99 per cent pure, is obtainable at 23.90c. a lb., delivered.

Non-Ferrous Metals at Chicago

CHICAGO, Feb. 10.—This market remains spotty with sales in smaller total volume than a week ago. Prices for tin and zinc are higher The old metal market is quiet.

Prices per lb., in carload lots: Lake copper, 18.50c.; tin, 39.90c.; lead, 6.20c.; zinc, 5.35c.; in less-than-carload lots, antimony, 9.75c. On old metals we quote copper wire, crucible shapes and copper clips, 14c.; copper bottoms, 11.50c.; red brass, 11.50c.; yellow brass, 8c.; lead pipe, 4.50c.; zinc, 3c.; pewter, No. 1, 24.50c.; tin foil, 22c.; block tin, 32c.; aluminum, 12.87½c.; all being dealers' prices for less-than-carload lots.

Snyder Mining Co. Is Formed

Shenango Furnace Mines and Crucible Company to Operate Jointly on Mesabi Range

PITTSBURGH, Feb. 10.—Announcement is made today by W. P. Snyder, Jr., president, Shenango Furnace Co., of the formation of the Snyder Mining Co. for the purpose of taking over the ownership and operation of the extensive mining properties of the Shenango Furnace Co. on the Mesabi Range in Minnesota. These properties include the Shenango, Webb, Whiteside, South Tener and Virginia mines.

This new company is owned jointly by Shenango Furnace Co. and Crucible Steel Co. of America. The officers are: President, W. O. P. L. Collord; secretary, H. M. Wilson; treasurer, F. A. Demms. E. J. Maney, general manager of Shenango company's ore properties for a number of years past, will continue as general manager of the Snyder Mining Co., with the same organization and policies as heretofore.

Acquisition of this interest by Crucible Steel Co. gives it valuable ore reserves, and will result in a larger and more uniform operation of the properties in the future. The directors of the Snyder Mining Co. are W. P. Snyder, H. S. Wilkinson, G. L. Collord, F B. Hufnagel, E J. Maney and R. M. Keeney. The general offices of the company will be 812 Oliver Building, Pittsburgh, and the mining office in the Alworth Building, Duluth.

Selling Road Machinery to Brazil

American road-making equipment is generally preferred in Brazil, although some European equipment has been purchased, principally from Germany and England, says a report received by the Department of Commerce from Howard H. Tewksbury, automotive trade commissioner to South America. Barring serious economic or political disturbances, there is every reason to believe that during the next few years there will be a continually increasing demand for all types of road-making machinery.

The demand exists not only with the Federal Government, but also with the more progressive State Governments and with the larger contractors undertaking road and bridge construction. Planers, scrapers, graders and tractors are commonly used in most of the East Coast States as far north as Pernambuco.

A comparatively small amount of concrete making machinery has been purchased for road building. A moderately large number of concrete mixers has been purchased in connection with bridge construction, etc. Boilers, levelers, scarifiers and drags are used to some extent.

Bethlehem Steel Corporation has awarded to Electric Machinery Mfg. Co., Minneapolis, Minn., an order for ten 300-hp. and four 500-hp. synchronous motors, to be installed in the Cambria plant, Johnstown, Pa. The 300-hp. motors are to be coupled to gas disintegrators used in washing blast furnace gas. Each of the four 500-hp. motors will be directly coupled to centrifugal pumps.

Greater Flexibility for Swinging Grinder

IN the illustration is a swinging grinder at work cleaning up a steel casting. This unit is suspended from a 1-ton jib crane, upon which it rides, depending from a four-wheel trolley. Current for the motor is furnished through flexible cable, thus providing for a good range of motion of the unit along the beam of the jib crane and a further swinging motion of the crane itself, so that a sizable area may be covered by the grinding wheel. This jib-and-trolley unit was built by the Cleveland Electric Tramrail, Wickliffe, Ohio.

Fabricated Structural Steel

Awards of 52,000 Tons in Third Large Week of the Year—New Projects of 25,000 Tons

AWARDS of close to 52,000 tons of structural steel in the past week compared favorably with an almost equivalent total in the previous week and 53,000 tons two weeks ago. The largest award was about 12,000 tons for electrification work on the Pennsylvania Railroad, and 6800 tons was placed for subway construction in New York. New projects totaling 25,000 tons were considerably in excess of the 10,500 tons of new business in the previous week. One of the largest was 5000 tons required by the Standard Oil Co. of New Jersey for substations on its Texas to Chicago gas line. The Victor Lawson Memorial Y. M. C. A. in Chicago calls for 2000 tons.

BOSTON & MAINE RAILROAD, 360 tons, three bridges, to Bethlehem Steel Co.

NEW YORK, 450 tons, school for Church of St. Benedict, Bronx, to Easton Structural Steel Co.

NEW YORK, 1700 tons, Steuben Club, Fifty-eighth Street and Lexington Avenue, to McClintic-Marshall Co.

NEW YORK, 1200 tons, warehouse, West Twentieth Street, to Levering & Garrigues Co.

JERSEY CITY, 900 tons, warehouse, to Lehigh Structural Steel Co.

NEW YORK CENTRAL, 290 tons, three grade-crossing bridges at Great Bend, Theresa and Briar Cliff Manor, to American Bridge Co.

NEW YORK CENTRAL, 300 tons, bridges at Cold Spring and Memphis, N. Y., to McClintic-Marshall.

NEW YORK, 6800 tons, subway route 110, section 3, to Harris Structural Steel Co.

STATE OF NEW JERSEY, 1600 tons, Hackensack River bridge, to Bethlehem Steel Co.

NEW YORK, 4700 tons, building at 21 West Street, to Levering & Garrigues Co.

NEW YORK, 1570 tons, apartment building, 302 East Forty-second Street, to Harris Structural Steel Co.

RENSSELAER, N. Y., 240 tons, building for Bayer Co., to McClintic-Marshall Co.

PENNSYLVANIA RAILROAD, 12,000 tons for electrification work, of which 7000 tons went to American Bridge Co., 1800 tons to McClintic-Marshall Co., 1785 tons to Bethlehem Steel Co., 715 tons to American Car & Foundry Co., and 700 tons to Belmont Iron Works.

PENNSYLVANIA RAILROAD, 419 tons, two highway bridges; Sunbury, Pa., 306 tons and Harrisburg, Pa., 113 tons, to Phoenix Bridge Co.

PHILADELPHIA, 125 tons, Cayuga Street bridge, George F. Dobbin, general contractor, to McClintic-Marshall Co.

PHILADELPHIA, 2440 tons, Chestnut and Walnut Streets, viaduct, to Shoemaker Bridge Co.

PHILADELPHIA, 600 tons, Olney Avenue bridge, to Bethlehem Steel Co.

NORFOLK & WESTERN RAILROAD, 600 tons, bridges, to Virginia Bridge & Iron Works.

NORFOLK & WESTERN, 825 tons, office building at Roanoke, to Virginia Bridge & Iron Co.,

ATLANTA, GA., 1100 tons, addition to First National Bank building, to Ingalls Iron Works.

STATE OF TEXAS, 2000 tons, oil storage tanks for Paso-Tex Co., to an unnamed bidder.

EAST PITTSBURGH, PA., 2000 tons, office and laboratory for Westinghouse Electric & Mfg. Co., to American Bridge Co.

PERE MARQUETTE RAILROAD, 1700 tons, bridge work, to McClintic-Marshall Co.

CHICAGO, 3200 tons, transmission towers for North Indiana Public Service Co., to McClintic-Marshall Co.

CHICAGO, 110 tons, alterations to Blum building, to Duffin Iron Co.

EVANSTON, ILL., 170 tons, First Methodist Church, to A. Bolter's Sons, Chicago.

ST. LOUIS SOUTHWESTERN, 640 tons, tons, swing span bridge, to Kansas City Bridge Co.

KANSAS CITY, MO., 250 tons, Armour & Co., to Kansas City Structural Steel Co.

CHICAGO, 400 tons, 124th Field Artillery armory, to New City Iron Works, local.

RACINE, WIS., 150 tons, addition for Western Printing & Lithographing Co., to Milwaukee Bridge Co.

NORTHERN PACIFIC, 800 tons, bridge work, divided between American Bridge Co. and Milwaukee Bridge Co.

GARDINER, MONT., 245 tons, bridge over Yellowstone River; general contract to Stevens Brothers; steel to an unnamed bidder.

SAN FRANCISCO, 165 tons, apartment building, Buchanan and Pacific Streets, to McClintic-Marshall Co.

SAN FRANCISCO, 150 tons, Mission Bay ferry slip for Southern Pacific Co., to McClintic-Marshall Co.

SAN FRANCISCO, 200 tons, apartment building, O'Farrell and Franklin Streets, to Golden Gate Iron Works.

STOCKTON, CAL., 450 tons, bridge over San Joaquin River for Santa Fe Railroad, to American Bridge Co.

SACRAMENTO, CAL., 190 tons, garage for Pacific Telephone & Telegraph Co., to Pacific Coast Engineering Co.

SEATTLE, 1000 tons, Fourteenth Avenue South bridge, to Wallace Bridge & Structural Steel Co.

SEATTLE, 750 tons for King County jail, to Van Dorn Iron Works.

TACOMA, WASH., 350 tons, power house, Lake Cushman project, to Star Iron Works.

Structural Projects Pending

Inquiries for fabricated steel work include the following:

BOSTON & MAINE RAILROAD, 1000 tons, bridges.

NEW YORK, 11,000 tons, office building, Thirty-eighth Street and Broadway.

STATEN ISLAND, N. Y., 500 tons, buildings for Procter & Gamble Co.

STANDARD OIL CO. OF NEW JERSEY, 5000 tons, for substations along gas line to be built from Texas to Chicago.

ROCHESTER, N. Y., 500 tons, Ridge Road bridge over Genesee River.

MONROE, MICH., 350 tons, extension for Consolidated Paper Co.

TOLEDO, OHIO, 1200 tons additional for Libby Owens Glass Co.

TOLEDO, 1400 tons for Toledo Scale Co.

MILWAUKEE, 2000 tons, addition to Post Office; bids on general contract close March 5.

EAST PEORIA, ILL., 150 tons, bridge, Milwaukee Bridge Co. low bidder.

CHICAGO, 2000 tons, Victor Lawson Memorial Y. M. C. A.

BAGNELLE, MO., 1600 tons, power house.

ST. LOUIS, 850 tons, toll building for Southwestern Bell Telephone Co.

CHICAGO GREAT WESTERN, 800 tons, bridge work.

ST. LOUIS-SAN FRANCISCO, 500 tons, bridge work.

HOUSTON, TEX., 3000 tons, oil storage tanks in Southwest for Humble Oil Co.

FORT WORTH, TEX., 800 tons, passenger station for Texas & Pacific Railroad.

SALINAS, CAL., 170 tons, office building: bids opened.

BERKELEY, CAL., 270 tons, library: bids opened.

PHOENIXVILLE, PA., 500 tons, junior high school.

Mineral Production of the United States in 1929

The estimated total value of mineral products in the United States in 1929 was approximately $5,900,000,000, as announced by Scott Turner, director of the United States Bureau of Mines, Department of Commerce. This is an increase of nearly 10 per cent over the total value of mineral products in 1928, and is due to increases in the total value of metals and the mineral fuels produced. The total value of non-metallic mineral products in 1929 decreased slightly as compared with 1928.

The increase in the value of metallic products is due chiefly to the increase in quantity and unit value of copper and iron produced. Lead and zinc also increased, but gold and silver decreased. The value of each of the mineral fuels produced showed increases, especially petroleum and natural gas. The total quantity of petroleum produced changed little, but there was a slight increase in the unit value. On the other hand, the total quantity of coal produced increased appreciably, but the total value increased relatively less, because unit values were lower.

The following figures give the estimated total value of metallic mineral products and non-metallic mineral products other than fuels and of mineral fuels produced in the United States in 1929:

Estimated Value of Mineral Products of the United States, 1929

Metallic	$1,540,000,000
Non-metallic (other than fuels)	1,200,000,000
Mineral fuels	3,160,000,000
Total	$5,900,000,000

These estimates are subject to revision and replacement by precise figures for 1929 as soon as the Bureau of Mines can complete the canvass of mineral industries just begun. In this canvass, the Bureau is sending to every mining, quarrying, and well-operating company an inquiry soliciting a report on the output of each mineral commodity by each producing establishment. Early success in this undertaking is dependent upon the continuation of the prompt and cordial response on the part of the mining companies which through many years has been the basis of success in this statistical endeavor.

PERSONAL

E. S. HOUDLETTE, vice-president in charge of sales for the Pacific Coast Steel Co., San Francisco, has retired after being connected with the company for over 20 years. He was born

E. S. HOUDLETTE

in Richmond, Me., in 1880, and a year later went to California. In 1910 he became associated with the Corrugated Bar Co., and when the Pacific Coast Steel Co. took over rights for manufacturing in 1911 he joined the latter company. Shortly afterward he was appointed secretary and later was elected vice-president in charge of sales. In 1925, when the Pacific Coast Steel Co. bought the Southern California Iron & Steel Co., Los Angeles, he was elected vice-president in charge of sales for the latter company, which continued to operate under its former name.

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H. M. LANE, industrial engineer, Detroit, was the guest of the New England Foundrymen's Association at its February meeting in Boston on Feb. 12. Mr. Lane discussed advances and constructive improvements in foundry practice.

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HARRY E. PENFIELD, Chicago, has been made president of the Hartford Machine Screw Co. PHILIP B. GALE is chairman of the board and treasurer. PIERRE M. BOYER has been appointed vice-president and general manager, succeeding J. CARLTON WARD, JR., as vice-president. Mr. Penfield is first vice-president of the Standard Screw Machine Co., which owns the Hartford company.

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R. L. TEMPLIN, chief engineer of tests, research laboratories, Aluminum Co. of America, New Kensington, Pa., addressed the Feb. 6 meeting of the Pittsburgh chapter of the American Society for Steel Treating. His subject was, "Effects of Cold Working on the Physical Properties of Metals."

JOHN T. WILKIN, president and chief engineer, Connersville Blower Co., Connersville, Ind., has been made general manager also. E. C. HASSLER, assistant superintendent, has been appointed acting superintendent, and W. E. NEWKIRK, purchasing agent, has become treasurer.

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W. EARLE PASHLEY, advertising manager, C. F. Pease Co., Chicago, manufacturer of blue-printing machinery, has been appointed assistant sales manager and vice-president.

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J. G. BENEDICT, general manager, Landis Machine Co., Waynesboro, Pa., and C. N. KIRKPATRICK, general sales manager, sailed on Jan. 31 for a two months' business trip in Europe.

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HYMAN BORNSTEIN, director of laboratories, Deere & Co., Moline, Ill., gave a talk on metallurgical control before the February meeting of the Tri-City chapter of the American Society for Steel Treating.

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FRANK B. WETHERILL, who has been associated with the Link-Belt Co., Chicago, for the past 15 years, has been placed in charge of the new branch office of the company in Vancouver, which has been established to supplement the service now rendered through Canadian distributers.

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F. R. PALMER, assistant to the president, Carpenter Steel Co., Reading, Pa., will speak on "Corrosion Resisting Steels," Feb. 11, at the meeting of the Hartford chapter of the American Society for Steel Treating.

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W. J. ZINK has been appointed representative for Alabama and vicinity for the Reading Chain & Block Corporation, Reading, Pa.

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S. LIVINGSTON MATHER, vice-president of the Cleveland Cliffs Iron Co., Cleveland, and a son of Samuel Mather, has been made a director of the Youngstown Sheet & Tube Co., Youngstown, succeeding the late A. E. Adams.

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HAROLD AMBLER has been elected vice-president of Frank D. Chase, Inc., Chicago, consulting engineer.

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MAX E. LANDRY has been appointed representative for the Foote Brothers Gear & Machine Co., Chicago, in the northern half of Oklahoma.

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R. G. RICHMOND, who has been identified for the past 25 years with the Waterbury Co., New York, wire rope manufacturer, has resigned as general manager.

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JAMES B. ARMSTRONG, who represents the Lebanon Drop Forge Co., Lebanon Steel Foundry Co., Byrne Mfg. Co., and other concerns in the New York territory, has moved his office to 1 East Forty-second Street.

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OTIS R. HALE, who has represented the American Locomotive Co. as Pittsburgh district sales manager for the past 10 years, has been transferred to the Pacific Coast, with headquarters at San Francisco. He started in the railroad business with the Southern Pacific, serving his apprenticeship at Tucson, Ariz., and remaining with the company for 16 years. In 1905 he went to Mexico and was master mechanic on many divisions of the old Mexican Central. In 1913 he went to Cuba as general master mechanic of the Cuban Central and later served as superintendent of motive power of this road. Later he became superintendent of motive power of the United Railways of Havana, having left that company in 1920 to go with the American Locomotive Co.

OTIS R. HALE

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S. A. HARDING, for a number of years connected with the Consolidated Machine Tool Corporation, Rochester, N. Y., has become affiliated with the Brandes Machinery Co., Cleveland machinery dealer.

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J. R. FARRELL has been transferred from the St. Louis office to the Tulsa office of the Gardner-Denver Co., Quincy, Ill. E. H. DIAMONDS, formerly of the Andrews & George Co., agent in Japan, is now associated with the San Francisco office.

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S. B. TAYLOR, who became associated in 1925 with the Reliance Electric & Engineering Co., Cleveland, as design engineer, has been promoted to assistant works manager.

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GEORGE H. CLYMER has been appointed district sales manager, at 732 Commercial Trust Building, Philadelphia, for the Wrought Iron Co. of America, Lebanon, Pa., succeeding the late ALBERT P. LOESCH.

C. R. ROBINSON, vice-president in charge of railroad sales for Inland Steel Co., has left for a five weeks' trip in the West Indies.

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EUGENE S. HOOPES was reelected president and general manager of the Union Drawn Steel Co., Beaver Falls, Pa., at a recent reorganization meeting, and EDWARD C. REBESKE was reelected secretary and treasurer. E. T. MCCLEARY, president of the Republic Iron & Steel Co., Youngstown, which recently acquired the Union Drawn company, was elected chairman of the board. Other members of the new board of directors are: R. J. WYSOR, identified with the Otis & Co.-Eaton-Mather interests at Cleveland; H. T. GILBERT and W. B. OHL of the Republic company, and GEORGE DAVIDSON, L. E. CREIGHTON and Mr. HOOPES, all of whom have been identified with the Union Drawn company.

New Steel Company to Sell Nitralloy and Rustless Steel

The formation of a new steel company, the Associated Alloy Steel Co., Inc., is announced jointly by M. T. Lothrop, president, Timken Roller Bearing Co.; Severn P. Ker, president, Sharon Steel Hoop Co., and H. G. Batcheller, vice-president, Ludlum Steel Co. It has been incorporated to sell exclusively corrosion, heat, and wear-resisting alloy steels produced by the Timken, Sharon and Ludlum companies. These products include nirosta, nitralloy and stainless steels.

The board of directors includes: H. G. Batcheller, J. Reid Evans, secretary and treasurer Sharon Steel Hoop Co.; Severn P. Ker, M. T. Lothrop, J. F. Strough, secretary and treasurer, Timken Roller Bearing Co., and Neil F. Towner, attorney, Albany, N. Y.

The active management will be under the direction of David B. Carson, vice-president and treasurer, formerly sales manager, development division, Central Alloy Steel Corporation. Headquarters of the company will be at Cleveland and branch offices and warehouses established in strategic centers throughout the country. Mill facilities are being expanded and additional equipment for the most recent production practices is already installed.

Mr. Batcheller, president of the new company, made the following statement: "We feel that Associated Alloy Steel Co. meets a very definite need in the alloy steel situation, providing at once the co-ordinated production of these materials in all forms under the finest supervision and metallurgical research and a centralized source of supply from which customers may obtain the varied forms necessary to meet their requirements. It provides greater efficiency in engineering and servicing and the economy in marketing necessary to supply materials at the lowest possible price."

OBITUARY

C. A. PENNOCK, vice-president and general manager of the Eastern Rolling Mill Co., Baltimore, Md., died suddenly on Jan. 27.

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CARLTON SCHWAB WAGNER, formerly owner of the Danville Structural Steel Co. and a nephew of Charles M. Schwab, died suddenly on Feb. 6, aged 36 years.

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ELIZABETH DREVER, president of the Tomahawk Steel & Iron Works, Tomahawk, Wis., since the death of her husband five years ago, died at Muskegon, Mich., Jan. 29, aged 68 years.

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WILLIAM F. COSTELLO, president, Mayville Iron Co., Mayville, Wis., died as a result of heart trouble, Feb. 4, aged 49 years.

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WALTER H. ALFORD, vice-president and comptroller of the Nash Motors Co., Kenosha, Wis., and associated with Charles W. Nash in the direction of that concern since its inception, died Feb. 5, following an attack of heart trouble, aged 64 years. He was born in Texas, was comptroller of the St. Louis Gas & Light Co. at an early age, and was called from there to serve as vice-president of the Buick Motor Co. in 1910, at which time Mr. Nash was president. When Mr. Nash resigned as president of the Buick company, to buy the plant of the Thomas H. Jeffrey Co. at Kenosha in 1915, Mr. Alford went with him as vice-president and comptroller of the new concern.

FRED MASON KIMBALL, advisory manager of the motor division of the industrial department of the Lynn, Mass., plant, General Electric Co., died at his home in Marblehead, Mass., on Feb. 5, following a protracted illness, aged 69 years.

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AUGUSTE C. E. RATEAU, long famous as the designer of the Rateau steam turbine and a pioneer in steam regenerators, so called, died in Paris, France, Jan. 13, aged 66 years. His extensive contributions to engineering and engineering literature have encompassed such fields as compression machinery, aeronautics, and steam prime movers. He was the recipient of many honors at home and abroad, including honorary membership in the American Society of Mechanical Engineers bestowed on him in 1919.

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WILLIAM L. HIRSCH, for a number of years Pittsburgh district sales agent for the American Steel & Wire Co., died on Feb. 7 at his home in Dormont, Pittsburgh. He was born in South Side, Pittsburgh, and began his business career with the old Schoenberger Steel Co., later the Schoenberger works of the Steel & Wire company. He was secretary and general freight agent of the Schoenberger company when it became a part of the United States Steel Corporation, and remained in charge of Pittsburgh sales for the Steel & Wire company until his retirement several years ago.

Four boats of the ore-carrying fleet operated by the vessel interest of the M. A. Hanna Co., Cleveland, are being re-tanktopped. The steamers Agassiz and E. N. Saunders Jr. are having the repair work done at the Ashtabula, Ohio, shipyard of the Great Lakes Engineering Co. and the J. J. Turner and E. A. Uhrig at the Ecorse, Mich., yard. The work involves an expenditure exceeding $200,000. These boats with the Q. A. Shaw have been sold to the Producers Steamship Co. A fleet of seven boats now is owned by that corporation, the other two being the W. A. Amberg and L. W. Hill.

Freight handled by the Federal Barge Line between St. Louis and New Orleans in December is estimated at 73,900 tons, against 103,478 in the preceding month and 135,439 tons in December, 1928. The total tonnage in 1929 was 1,293,971 tons, against 1,435,486 tons in 1928, and 1,237,430 tons in 1927. The decrease in 1929 from the total of the preceding year was due largely to the low stage of water in the Mississippi River during several months of 1929.

The semi-annual safety banquet of the Continental Steel Corporation of Kokomo, Ind., was held in that city recently with more than 200 persons, including officials, foremen and members of the department safety committees present. Henry Roemer, president of the company, was in charge of the program. W. H. Winans, New York, head of the industrial relations department of the Union Carbide & Carbon Co., was the principal speaker. Other guests included H. J. McMillan and J. E. Reagan of the Indiana Industrial Board and representatives of the Indianapolis and Canton, Ohio, branches of the corporation.

Three Freyn - Design continuous stock-line recorders have been purchased by the National Tube Co., two for installation at its National Works and the third is for its Lorain works.

Value of Exports 12 Per Cent Higher

Unit Value Up Also in 1929—Total Was Over $200,000,000, of Which Finished Steel Made $165,000,000

AVERAGE values per ton of iron and steel exports from the United States were $66.10 in 1929 and $62.78 in 1928, according to a compilation made by J. Joseph W. Palmer, Iron and Steel Division, Department of Commerce. The values are made up of the actual cost or selling price, plus the cost of cases or other packing when required, plus transportation charges from point of manufacture to seaboard or border customs district of exportation. For this reason the average prices can be compared only in a general way with those of similar products moving in the domestic trade. This becomes even more apparent when it is realized that shipments made through virtually every customs district are involved in making up the figures of total exports, values and average values, with the items of transportation cost a most widely variant factor.

Increase of $20,547,872, or 11.4 per cent, by value in 1929 was almost twice the rate of increase in tonnage, amounting to 5.8 per cent. Comparison of the wide range of values represented by the various classes of products results from considering the average value of $66.10 in 1929 in connection with that of the scrap, the lowest-priced item, $13.98, and wire cloth and screening, the highest, $391.41.

For purposes of ready comparison, several classes of products included were segregated into nine broad groups, the chief of which, both in point of tonnage and value, was plates and sheets, black, tinned and galvanized. Shipments of these products in 1929 totaled 864,683 tons, valued at $74,651,432, reflecting sharp increases over the 1928 total of 821,846 tons, valued at $68,599,224. The most valuable item included in this total was tin plate, exports of which rose to $28,566,189 in 1929 from $26,345,576 in 1928, with a corresponding increase in tonnage shipped. Shipments of galvanized sheets, plates and black steel sheets rose in value, although the tonnage exported in 1929 was less than that shipped the previous year.

Values of Iron and Steel Exports During 1928 and 1929

	1929			1928		
	Gross Tons	Value	Average, Per Ton	Gross Tons	Value	Average, Per Ton
Pig iron, no alloys	46,352	$829,925	$17.90	84,682	$1,366,794	$16.14
Ferromanganese and spiegeleisen	1,574	59,036	37.51	9,440	232,990	24.68
Iron and steel scrap	552,372	7,721,393	13.98	516,139	6,615,359	12.82
Rough materials	*600,298*	*8,610,354*	*14.34*	*610,261*	*8,215,143*	*13.46*
Ingots, blooms, etc.	45,578	1,332,061	29.23	30,101	1,232,901	40.96
Wire rods	42,250	2,007,557	47.52	38,617	1,733,693	44.89
Skelp, iron or steel	130,975	5,507,363	42.05	131,754	5,383,919	40.86
Semi-finished	*218,803*	*8,846,981*	*40.43*	*200,472*	*8,350,513*	*41.65*
Plates	193,695	10,037,565	51.82	166,269	8,399,671	50.52
Bars, iron	4,074	333,529	81.87	6,229	492,477	79.06
Bars, steel	190,023	10,337,618	54.40	158,475	9,114,056	57.51
Bars, alloy steel	15,744	1,684,508	106.99	14,079	1,486,568	105.59
Galvanized sheets	154,533	15,333,572	99.23	152,280	14,663,965	96.30
Black steel sheets	170,782	13,978,996	81.85	179,286	13,576,541	75.73
Black iron sheets	15,955	1,597,042	100.10	16,289	1,634,497	100.34
Hoops, bands, and strip steel	70,753	5,138,068	72.62	58,080	3,978,974	68.51
Tin plate	258,965	28,566,189	110.31	249,642	26,345,576	105.53
Structural shapes, plain	273,096	12,683,790	46.44	202,804	8,753,890	43.16
Structural shapes, fabricated	112,235	9,657,334	86.05	92,758	8,112,417	87.46
Metal lath	5,443	815,533	149.83	5,358	830,401	154.98
Steel rails	149,234	5,360,912	35.92	190,905	6,925,616	36.28
Rail fastenings, switches, etc.	32,614	3,194,282	97.94	41,995	3,482,786	82.93
Boiler tubes	19,473	2,486,571	127.69	18,749	2,300,509	122.70
Casing and oil line pipe	117,025	11,951,311	102.13	119,785	11,399,020	95.16
Black and galvanized welded pipe	145,937	13,260,747	90.87	110,361	9,626,961	87.23
Plain wire	45,629	3,676,693	80.58	46,177	3,467,458	75.09
Barbed wire and woven wire fencing	64,463	4,439,240	68.86	74,335	5,014,600	67.46
Wire cloth and screening	1,692	662,273	391.41	1,884	626,171	332.36
Wire rope	6,959	1,898,494	272.81	5,367	1,577,875	294.00
Insulated wire and cable	1,075	396,850	369.16	640	217,107	339.23
Other wire and manufactures	10,402	2,401,477	230.87	9,812	2,145,166	218.63
Wire nails	12,887	832,656	64.61	14,547	955,722	65.70
Nails, other than wire	9,582	1,572,919	164.15	9,149	1,455,698	159.11
Tacks	674	210,196	311.86	743	228,590	307.66
Bolts, nuts, etc., except track	16,235	3,145,364	193.74	13,278	2,536,754	191.05
Rolled and finished	*2,099,179*	*165,653,729*	*78.91*	*1,959,276*	*149,349,066*	*76.23*
Malleable iron screwed pipe fittings	12,514	3,880,152	310.06	10,034	2,857,330	284.76
Cast iron screwed pipe fittings	13,879	2,384,960	171.84	7,359	1,347,804	183.15
Cast iron pressure pipe and fittings	14,879	1,406,085	94.50	9,941	913,670	91.91
Cast iron soil pipe and fittings	17,003	1,265,988	74.46	16,679	1,088,137	65.24
Iron castings	10,976	1,572,133	143.23	12,061	1,517,737	125.84
Steel castings	10,824	2,972,064	274.58	9,710	2,550,561	262.67
Car wheels and axles	21,460	1,559,414	72.67	17,139	1,309,196	76.39
Horseshoes	440	68,611	155.93	468	73,302	156.63
Iron and steel forgings	12,097	2,207,583	182.49	11,703	2,307,723	197.19
Castings and forgings	*114,072*	*17,316,990*	*151.81*	*95,094*	*13,965,460*	*146.86*
Total	3,032,352	$200,428,054	$66.10	2,865,103	$179,880,182	$62.78

Safety Conference in New York

Because of the great increase of accidents in the Metropolitan area, a meeting will be held on Feb. 26 at the Hotel Pennsylvania, New York, of those interested in saving of life and property. An all-day industrial accident-prevention program has been prepared under the auspices of the four national engineering societies, the Metropolitan Chapter of the American Society of Safety Engineers, Engineering Section, National Safety Council, American Welding Society, Merchants Association and various other local and civic organizations.

Speakers will include C. S. Ching, supervisor of public relations, United States Rubber Co., who will be general chairman of the morning session; Frances Perkins, industrial commissioner, New York State Department of Labor, who will address the luncheon meeting; Arthur H. Young, Industrial Relations Counsellors, New York, toastmaster at luncheon; C. E. Pettibone, president, National Safety Council; L. A. DeBlois, National Bureau of Casualty and Surety Underwriters, chairman of afternoon session; L. P. Alford, vice-president, Ronald Press Co., New York; J. L. Gernon, New York State Department of Labor, Albany.

Commercial vehicle operations will be discussed at a special session, presided over by J. E. O'Gara, assistant general manager, R. H. Macy & Co. Speakers will include C. F. Lyon, vice-president, Motor Haulage; A. J. Mineur, Borden Co.; Philip D. Hoyt, first deputy police commissioner of New York.

Four hot-blast stove linings for the Bethlehem Steel Co. have been ordered from H. A. Brassert & Co., Chicago, for its No. 7 blast furnace at Johnstown, Pa. The total heating surface of these stoves will be 720,000 sq. ft., which is said to be the largest heating surface for any blast furnace in the world. The Bethlehem Steel Co. has ordered also from H. A. Brassert & Co. four 42-in. cold blast valves to be used in connection with these stoves.

Bi-Metallic Products Co., Charleroi, Pa., has been organized to manufacture bi-metallic products by combining ferrous and non-ferrous metals. The company has taken over the plant formerly used by the Charleroi Steel & Foundries Co. Officers are: A. E. Strasser, president; Norman Allderdice, and J. C. Curtin, vice-presidents, and Herbert H. Hallsted, secretary and treasurer.

Total Lake Ore Shipments Near Record

1929 Movement Within 1 Per Cent of 1916—Water Shipments Were Largest Ever Made

TOTAL iron ore shipments from the Lake Superior region in 1929 are reported by the Lake Superior Iron Ore Association at 66,157,359 gross tons, of which 65,195,595 tons was shipped by water and 961,764 tons all-rail. The water shipments made the highest quantity ever recorded, exceeding for the first time the great record of 64,734,198 tons made in 1916. Total shipments fell nearly 1 per cent below the total of 66,658,466 tons of 1916, when all-rail shipments were double those of 1929.

Only four years, other than 1916 and 1929, have reached 66,000,000 tons in total shipments: 1917, with 64,437,003 tons; 1918, with 62,836,172 tons; 1920, with 60,411,572 tons; 1923, with 60,780,003 tons. Of these, the two last named were well below 60,000,000 tons in water shipments.

Compared with 1928, when total shipments were 54,855,641 tons, a gain of 20.6 per cent was registered last year, lake shipments showing an advance of 20.8 per cent, and all-rail shipments, of 10 per cent. Shipments by ranges for 1929 and 1928 are shown in a table herewith.

Considerable change occurred in order of size of the shipments from the several ranges, 1929 compared with 1928. Marquette, Vermilion and Mayville shipped less last year than in 1928, the latter disappearing completely. Hence Marquette, second in 1928, became fourth in 1929, and Vermilion dropped from fifth to sixth. Meantime Gogebic passed both Marquette and Menominee, becoming second, with Menominee third. Cuyuna passed Vermilion to take fifth position.

Mesabi, as for years past, retained first place. Shipments from this range gained 21.5 per cent, being 65 per cent of total shipments from all ranges. Gogebic showed the larger increase of 77.3 per cent. Menominee advanced 16.6 per cent and Cuyuna, 55.4 per cent. Marquette suffered a decline of 21.2 per cent, and Vermilion, of 14.8 per cent.

Mines showing the largest shipments of the several ranges were as follows:

Mesabi: — Missabe Mountain, 6,252,284 tons; Sellers, 5,031,846 tons; Mahoning, 4,041,001 tons; Hull Rust 2,559,412 tons; Adams-Spruce group, 2,163,229 tons; Hill Annex, 1,813,341 tons; Hartley-Burt-Palmer, 1,346,169 tons.

Gogebic: — Montreal and Ottawa, 1,432,487 tons; Norrie-Aurora, 1,272,308 tons; Newport, 652,012 tons; Wakefield, 631,316 tons.

Vermilion:—Pioneer, 897,658 tons; Sibley, 406,400 tons; Zenith, 347,615 tons; Soudan, 161,703 tons.

Marquette:—Morris Lloyd, 638,234 tons; Negaunee, 637,960 tons; Cliffs Shaft, 510,930 tons; Athens, 485,940 tons.

Menominee:—Bristol, 562,836 tons; Penn, 472,381 tons; Chapin, 432,275 tons; Caspian, 335,885 tons; Rogers, 323,883 tons.

Cuyuna: — Louise, 342,958 tons; Armour No. 1, 340,583 tons; Mahnomen, 319,397 tons; Sagamore, 271,701 tons.

Shipments were made in 1929 from 81 Mesabi range mines, of which five shipped from stock piles only. One new mine—Morrow—started in with 1392 tons shipped. Menominee range shipments were from 30 mines. Those from Cuyuna range came from 14 mines, one being stock pile only. Five mines on Vermilion range made shipments: 20 on Gogebic range, one being stock pile only; and 21 from Marquette range. One of the latter, Richmond, was new, shipping 164,503 tons.

In all, 171 mines contributed to the year's shipments, two being new units. Of this total, seven made stock-pile shipments only. This compares with 168 mines in operation in 1928. Mesabi showed a net gain of four, offset by losses of one in Menominee, four in Marquette, two in Cuyuna and one in Mayville-Baraboo. Gogebic showed no change.

Ore beneficiated by various methods was 22,939,761 tons, an increase of 13 per cent on the 20,305,920 tons of 1928. Sintering showed a gain of almost 80 per cent. Figures for the different methods are shown in tabular form.

BENEFICIATED IRON ORE, 1929
(Gross Tons)

Method	Minnesota	Michigan and Wisconsin	Total
Washing	5,874,028	.....	5,874,028
Jigging	84,000	.....	84,000
Drying	341,759	.....	341,759
Sintering	224,063	.....	224,063
Total Concentrated	6,523,850	.....	6,523,850
(a) Crushing and Screening	9,455,553	6,960,358	16,415,911
Total Beneficiated	15,979,403	6,960,358	22,939,761

(a) Improves physical structure only.

SHIPMENTS OF LAKE SUPERIOR IRON ORE (a)
(Gross Tons)

Range	To Upper Lake Ports, 1929	All-Rail, 1929	Total, 1929	Total, 1928
Mesabi	42,437,963	570,276	43,008,239	35,398,660
Gogebic	7,620,062	4,023	7,624,085	4,298,717
Menominee	5,643,451	1,944	5,645,395	4,841,639
Marquette	5,153,042	256,670	5,409,712	6,540,019
Cuyuna	2,553,129	43,057	2,596,186	1,671,464
Vermilion	1,787,948	85,794	1,873,742	2,097,716
Mayville	none	none	none	7,426
Total	65,195,595	961,764	66,157,359	54,855,641
Canadian	none	none	none	none

(a) Figures by ports and by ranges, 1922 to 1928, appear on page 493, THE IRON AGE, Feb. 14, 1929.

Heavy Subscriptions for Employee Bonds

More than 40 per cent of the employees of the General Electric Co. subscribed $7,605,910 to the eighth annual offering of G. E. Employees Securities Corporation bonds, it has been announced by S. L. Whitestone, comptroller, General Electric Co. This is the largest subscription ever made to any offering of the bonds, and exceeds the 1929 offering, the previous high, by $844,960.

At the close of 1929 there were 30,484 employee bondholders, an increase of approximately 1500 over 1928. The average amount held by each employee was $1,117, as compared with $1,100 at the close of 1928. The bonds bear 6 per cent interest and so long as the original holder remains an employee an additional 2 per cent is paid by the company.

Handbook on Refractories

Harbison-Walker Refractories Co., Pittsburgh, in its new book entitled "Modern Refractory Practice," has issued a well-printed and beautifully bound handbook of information. While it is written primarily to catalog the company's products, these are so varied that the 180 large pages are filled with general information about the nature and production of various classes of refractories and their commercial uses. Unusual matter is included about the new high-aluminum brick and other special clays and cements.

A 30-page illustrated chapter deals with the principal types of furnaces used in the various metallurgical, power and ceramic industries, and notes briefly the special problems introduced by each application. Finally the book contains a series of tables of brick sizes and numbers required for various arches and other geometric shapes met in furnaces, some of which appear to be unique in scope and method of presentation.

Bethlehem Steel Corporation has announced its seventh annual offering to employees of its 7 per cent preferred stock. The price is set at $125. Subscriptions will be received until March 1, and employees are entitled to make payments in cash or in instalments spread over a period of 29 months.

Many Records in Copper for 1929

Domestic Withdrawals and Output at New High—Imports Exceeded Previous Years—Exports Declined

MANY records were broken by the copper industry in 1929, according to the United States Bureau of Mines. Domestic withdrawals, which assumed record-breaking proportions in the fall of 1928, continued at a high rate and for the year 1929 were higher than ever before, even than during the war years.

Heavy demand followed by increased prices brought forth the highest smelter and refinery production on record. The heavy demand in the fall of 1928 drew heavily on stocks of refined copper and at the end of the year only 114,000,000 lb. were in stock, while the largely increased production during that period made itself apparent in blister stocks which were larger than at the end of 1927. Production has been sufficiently ahead of withdrawals in 1929 for stocks of refined copper to much more than double during the year.

Curtailed production at the mines and smelters during the last quarter of 1929 has been apparent first in blister stocks again and these are estimated by producers to have increased only about 5 per cent.

The smelter production of copper from domestic ores in 1929, as determined by the Bureau of Mines from reports of the smelters showing actual production for 11 months and estimated production for December, was 2,030,000,000 lb., compared with 1,826,000,000 lb. in 1928. The 1929 production is 11 per cent higher than that of 1928, and is the largest production on record.

Production of new refined copper from domestic sources, determined in the same manner as smelter production, was about 2,022,000,000 lb., compared with 1,792,000,000 lb. in 1928. In 1929 the production of new refined copper from domestic and foreign sources amounted to about 2,772,000,000 lb., compared with 2,488,000,000 lb. in 1928, an increase of 284 000,000 lb. or 11 per cent. The production of secondary copper by primary refineries increased from 232.000.000 lb. to about 308,000,000 lb. in 1929, or 76,000,000 lb., so that the total primary and secondary output of copper by the refineries was 13 per cent higher in 1929 than in 1928, being about 3,080,000,000 lb. compared with 2,720,000,000 lb.

Imports Increased, Exports Fell Off

The imports of unmanufactured copper during the first 11 months of 1929, according to the Bureau of Foreign and Domestic Commerce, amounted to 905,912,237 lb., a monthly rate of 82,000,000 lb. compared with 787,073,640 lb. for the entire year 1928, a monthly rate of 66,000,000 lb. The total imports for 1929 will very likely show an increase in quantity of approximately 200,000,000 lb. for the year, or 25 per cent.

The exports of metallic copper during the first 11 months of 1929 amounted to 933,255,654 lb. compared with 1,121,186,640 lb. exported during the entire year 1928. If the exports of metallic copper in December equal the monthly average for the first 11 months of the year, nearly 85,000,000 lb., the total for 1929 will be about 1,018,000,000 lb.

Refineries report that at the end of 1929 approximately 265,000,000 lb. of refined copper would be in stock, considerably more than double the 114,000,000 lb. at the end of 1928. It is estimated that stocks of blister copper at the smelters, in transit to refineries, and at refineries, and materials in process of refining, would be about 443,000,000 lb. on Dec. 31, compared with 423,000,000 lb. at the end of 1928, an increase of 20,000,000 lb. Therefore, an increase of 171,000,000 lb. in total smelter and refinery stocks is indicated.

The quantity of new refined copper withdrawn on domestic account during the year was about 1,849,000,000 lb., compared with 1,609,000,000 lb. in 1928, an increase of 240,000,000 lb. or nearly 15 per cent, and were the highest ever recorded. The method of calculating domestic withdrawals is shown in the table at the bottom of the page.

SUPPLY AND WITHDRAWALS OF NEW REFINED COPPER
(In Millions of Pounds)

	1928	1929
Refinery production of new copper:		
From domestic sources	1,792	2,022
From foreign sources	696	750
Imports of refined copper (a)	85	128
Stocks of new refined copper, Jan. 1	171	114
	2,744	3,014
Exports of refined copper (ingots, bars, rods or other forms) (a)	1,021	900
Stocks Dec. 31	114	265
	1,135	1,165
Total withdrawn on domestic account	1,609	1,849

(a) December, 1929, estimated.

German 1929 Exports Over 5,000,000 Tons

Largest Foreign Shipments Since 1913, Showing 19 Per Cent Gain on 1928—Imports Were Smallest Since 1926

WASHINGTON, Feb. 4.—Making a gain of 819,327 metric tons, exports of iron and steel products from Germany in 1929 aggregated 5,129,043 tons, against 4,309,716 tons in 1928, while imports declined 594,658 tons to 1,441,054 tons from 2,035,712 tons. Exports in December, according to a cablegram received by the Department of Commerce from Trade Commissioner James E. Wallis, Berlin, totaled 417,900 tons, an increase of 8288 tons over those of November, while imports decreased 8428 tons to 101,508 tons. The 1929 exports were the highest for any year since 1913; imports were the lowest since 1926.

The showing in Germany's export trade is considered unusual, for 1929 opened with the bulk of the country's steel mills just coming into full production after a month-long lockout late in 1928, soon followed by the extremely cold weather of February and March, when steel shipments were only about one-half of the normal movement, due to crippled transportation.

With 95 blast furnaces in operation at the end of December, the production of pig iron in that month totaled 1,100,378 tons. The output of steel ingots and castings in December was 1,156,105 tons. For 1929 the total pig iron production was about 13,397,000 tons and the steel output was 16,234,000 tons. Both figures are the highest since 1913. They compare with 1928 output of about 11,620,000 tons of pig iron, and 14,290,000 tons of steel and with heavier figures in 1927, at 12,900,000 tons of pig iron and 16,060,000 tons of steel.

Airport construction work in the United States during 1930 will have a value of $75,000,000 and the projects undertaken will exceed by 50 per cent those of 1929, according to W. A. Hardenbergh, associate editor of the *Public Works Journal*, New York, who spoke at a meeting of the American Road Builders' Association at Atlantic City recently. He said that this prediction was based on reports obtained from the Bureau of Aeronautics of the United States Department of Commerce.

Institute of Scrap Iron and Steel, Inc., will hold its second annual convention at the Stevens Hotel, Chicago, on March 4, 5 and 6.

Where Our 1929 Scrap Exports Went

Japan Took Three-Eighths of the 552,372 Tons—a Similar Quantity Went to Europe—Canada Second Only to Japan

WASHINGTON, Feb. 7.—Exports of iron and steel scrap from the United States, aggregating 552,372 gross tons, the largest item from point of volume in the iron and steel outgoing movement, exceeded those of 1928 by 36,233 tons. Scrap went from 31 of the United States customs districts to 31 world markets, according to a compilation made by Joseph W. Palmer, Iron and Steel Division, Department of Commerce. The volume of shipments in 1929 fluctuated considerably, varying between 21,552 tons in February and the 62,857 tons in August. The changes made it impossible to determine any definite trend, although the closing months were marked by relative stability.

The heavy movement of scrap from the United States, especially marked during the past two years, reflected the extensive and growing use of scrap in the production of pig iron and crude steel throughout the world. Because the supplies of scrap in most areas are distinctly limited, the United States has risen to first position as an exporting country of that commodity.

The 1929 exports of scrap constituted 18.25 per cent of the total iron and steel export tonnage. But the value, $7,721,393, amounted to only 3.9 per cent of the total iron and steel export trade. The average value of scrap exported in 1929 was $13.98 a ton, compared with $66.10 a ton for all classes of products entering into the trade. The respective averages in 1928 were $12.82 and $62.78.

Exports of scrap last year reached seven more world markets than in 1928. There was a loss of five markets and a gain of 12. Comparative statistics show also that, for those 18 markets to which shipments were made in both years, shipments to ten countries increased in 1929, while in eight cases the trade declined. Exports were made to eight European countries, to 11 countries of North and South America and the West Indies, to ten of Asia and the Far East and to two countries in Africa.

The largest foreign consuming market was Japan, which took 208,260 tons. Canada took 111,849 tons; Italy, 87,863 tons; Poland, 75,031 tons; Germany, 20,330 tons; Spain, 11,908 tons. The heaviest shipments for any customs district, totaling 123,799 tons, moved through Galveston, while 75,788 tons moved through Michigan, 54,930 tons through Florida, 52,139 tons through New Orleans and 31,362 tons through Massachusetts.

In 1929 shipments to Asia and the Far East totaled 221,853 tons, or 40.2 per cent of the year's total, and an increase of 48,822 tons over the 173,031 tons exported to those markets in 1928, which represented 33.6 per cent of the total 1928 shipments. Exports to European consumers rose to 201,856 tons, or 36.5 per cent of the total in 1929, from 159,332 tons or 30.8 per cent of the total in 1928. Exports to the several American countries declined to 119,963 tons from 183,776 tons in 1928.

Films Tell Story of Monel Metal

The Rothacker Film Corporation, Chicago, has released a two-reel motion picture telling the story of Monel metal. The film shows the preparation of the metal in its various commercial forms and traces its use in more than a score of different industries. Also shown in the film is the tapping of an 11-ton furnace with the molten metal being poured at a temperature of 3000 deg. fahr. The picture may be obtained by schools, societies, commercial organizations and the like without charge and is available in 16 and 35 mm. widths.

Fellowships at University of Michigan

Industry is demanding an increasing number of engineering graduates who have had one or more years of supplementary study, according to Alfred H. White, professor of chemical engineering, University of Michigan, Ann Arbor. Unusual facilities for such post-graduate work in chemistry and metallurgy have been installed in the engineering buildings at Ann Arbor, and these are being utilized by no less than 42 graduate students, of whom 20 already have the master's degree and are working for doctorates. The department of engineering research has important contacts with industry and several fellowships will be available for graduate students during the next academic year. Application should be made before March 1.

Enter General Industrial Building Field

Arthur G. McKee & Co., Cleveland and London, engineers and contractors in connection with blast furnaces, steel plants and oil refineries, have extended their activities to include general industrial building engineering and construction. The company has heretofore largely limited itself to building operations incidental to its specialized work. A. R. McCreary of New York has been appointed manager of the building construction department. He has had extensive industrial and general building experience, having been vice-president and general manager of the Crowell-Lundoff-Little Co., Cleveland, and subsequently connected in executive capacities with the Foundation Co. and Hoggson Brothers, both of New York.

Removable and Permanent Concrete Forms

Simplified practice recommendation R87-29 on sizes of removable and permanent forms, pans or domes made of wood, steel or other material, and used in concrete ribbed floor construction, is a further contribution to the program of elimination of waste through simplified commercial practice. This has been published by the United States Bureau of Standards in a pamphlet of 14 pages which gives, among other things, a list of those who attended the conference at which the matter was discussed in detail and as a result of which the simplification program was worked out. Copies may be obtained at 5c. each from the Superintendent of Documents, Government Printing Office, Washington.

Why Tool Steels Fail

Causes for tool steel failures, as summarized from reports of tool steel mills and users, were discussed by A. H. d'Arcambal, for the past 11 years consulting metallurgist to the Pratt & Whitney Co., Hartford, in a paper on the subject before the Cleveland chapter of the American Society for Steel Treating on Feb. 10. He also touched on the problems encountered in hardening metal-cutting tools. He will use both specimens and lantern slides to illustrate his paper. He is a director of the American Society for Steel Treating, and past chairman of the society's Hartford chapter.

Electric Roll Heaters

The Tokuyama Sheet Steel Co., Tokuyama, Japan, has purchased two electric roll heaters from Freyn Engineering Co., Chicago. The Eastern Rolling Mill Co., Baltimore, has also purchased two electric roll heaters, raising its total to 21.

Production of electricity by public utility power plants in the United States was more than twice as great in 1928 as in the boom year 1920, according to figures compiled by the Geological Survey. In millions of kwhr., the 1928 output was 87,850, a new high record having been attained not only in 1928 but in each preceding year beginning with 1922. The gains have been consistent and large, that for 1928 having been 9.5 per cent. The lowest gain in the period mentioned was 6 per cent, in 1924, and the highest 16.8 per cent, in 1923.

Credit Resuming Flow to Normal Channels

National Building Survey Conference Finds Money Easier, Particularly for Construction Loans

WASHINGTON, Feb. 11.—Carrying out the suggestion of iron and steel and other industrialists at their meeting with President Hoover on Nov. 21, that a speeding up of construction, repairs, replacements, etc., would serve as one of the most important stabilizing influences in the business situation, the National Building Survey Conference, under the direction of the chairman, Fenton B. Turck, vice-president, American Radiator Co., has reported that a survey indicates that credit is resuming its flow in normal channels in larger volume, a trend that is taken to mean increased activity in the construction field.

The survey, in which banks, building and loan associations, insurance and mortgage companies cooperated, was declared to show that building mortgages and allied conditions on the West Coast are now favorable, money being available in sufficient quantity for prudent residential, renovating and business building loans. The situation in most sections was held to have improved, while no favorable change was noted in the districts surrounding Chicago, Detroit, Pittsburgh, and Indianapolis.

The executive committee of the National Business Survey Conference has addressed a communication to members of the general committee seeking comprehensive and prompt reports on current business conditions from the national viewpoint. The reports are to indicate the present trends of business activity, as compared with the normal trend during January, February and March, the purpose being to determine the present rate of economic progress. Additional questions were submitted looking to the development of practicable methods of reflecting from time to time and with a greater degree of accuracy the general business situation.

The following appointments have been made to the executive committee of the building conference: R. B. White, Kansas City, Mo., representing important lumber interests; A. C. Pearson, chairman, United Business Publishers, New York, and William A. Starrett, president, Starrett Brothers, Inc., New York. Additional members will be named later.

Trade Practice Conferences Very Successful

WASHINGTON, Feb. 11.—Between 85 and 90 per cent of the non-ferrous ingot metal industry was represented at the trade practice conference held here with Chairman Garland S. Ferguson, Jr., of the Federal Trade Commission last Thursday at the Chamber of Commerce of the United States, when a set of rules looking to the elimination of unfair trade practices was adopted.

The fact that the conference was the one-hundredth of the kind held drew from Chairman Ferguson a statement pointing to the record that has been made through cooperation between the commission and industry by means of these conferences for the purpose of helping industry to regulate itself. The appeal of the conferences to industry has been remarkable.

Mr. Ferguson explained that the first conference took place in 1919, but that 75 per cent of the conferences have been held since 1926, the year in which the Federal Trade Commission organized its division of trade practice conferences. Even more striking was the fact that 50 per cent of the conferences were held in 1929.

"That 1930 will be a great year for trade conferences is apparent," said Mr. Ferguson. "Six such meetings have been held already with as many industries, while a dozen others have been authorized by the commission but not yet scheduled as to time and place, and there are more in the making in the form of applications of various industries for the holding of conferences."

Chairman Ferguson explained that "no industry is perfect and neither is the trade practice conference procedure, but through cooperation and good faith we are all striving to improve." He added: "It is this cooperation and determination that makes self-regulation of industry possible; but even so, after the industry draws up its rules, there is lacking a certain necessary means of enforcement, and that is where the Federal Trade Commission functions. The rules are presented to the commission for action; the commission condemns those practices considered to be in violation of the law and affirmatively approves the rules of the industry in so far as they cover these violations.

"The element of enforcement is implied—it is there ready to be used when and if necessary, but, in behalf of the American business man and his sense of fair play, it may be justly recorded that this necessity has arisen in connection with less than 5 per cent of the rules adopted."

Glasgow Iron Mill to Be Scrapped

The Glasgow works of the Glasgow Iron Co., Pottstown, Pa., including eight double puddling furnaces and a 96-in. sheared plate mill, are to be scrapped, the company retaining its Valley mill in Pottstown, which produces boiler fittings, flanges and other pressed steel specialties. The lower works of the company in Pottstown was leased from the Pottstown Iron Co. in 1898, but was purchased about a year ago by the McClintic-Marshall Co.

The Glasgow Iron Co. was started in 1874 with six double puddling furnaces and muck rolls, at that time operated by water power. A steam-driven, 96-in. plate mill was added to the plant in 1876 for the production of iron boiler plate. In 1886 two 3-ton steel converters were added to the equipment to produce mild steel for boiler and firebox plates. In 1889 the No. 2 mill at Glasgow went into operation and continued until dismantled in 1916.

The present officers of the Glasgow Iron Co. are Comly B. Shoemaker, II, president and general manager; A. C. Smith, treasurer, and Harry W. Prizer, secretary.

Steel Companies Report Good 1929 Earnings

The Youngstown Sheet & Tube Co., Youngstown, and subsidiaries in the year ended Dec. 31, 1929, had net income of $21,564,174, after all charges, including bond interest. This compares with $10,446,336 in the preceding year, an increase of 106 per cent. In the last quarter of the year net earnings amounted to $4,270,060, as compared with $6,756,741 in the preceding quarter, and with $3,573,695 in the corresponding quarter of 1929.

The McKeesport Tin Plate Co., McKeesport, Pa., had net profit of $2,402,200 in 1929, as compared with $1,587,918 in the preceding year.

The Apollo Steel Co., Apollo, Pa., had net profit of $302,192 in 1929, after adjustment of inventory and accounts, but before depreciation and taxes. Total shipments of finished steel during the year amounted to 114,849 tons. This brought the company a sales total of $7,395,471. During the year the company placed into operation a new mill for the production of automobile body and furniture sheets at a cost of $750,000.

Sheet and Tube Company to Build $10,000,000 Mill

The Youngstown Sheet & Tube Co., Youngstown, has announced that it will begin work immediately on a new mill for the continuous rolling of sheet steel under the patents of the American Rolling Mill Co. The mill will be located at the company's Brier Hill works at Youngstown, and efforts will be made to complete it within the present year. The cost of the mill is estimated by the company at $10,000,000.

It is also stated that the Sheet & Tube Company is rapidly perfecting a process for the electric welding of steel pipe under patents evolved in the company's own laboratory.

Machinery Markets and News of the Works

Spotty Improvement Noted

Machine Tool Sales Turn Upward Slightly—Inquiries Are More Numerous

A SPOTTY improvement in machine tool sales has occurred during the past week. The demand for lathes, it is reported from Cincinnati, has turned upward. In general, the volume of buying has not gained very much, but a New York dealer reports that its sales in the past week were the largest for any week since last November.

There is much more activity in inquiries than in orders. Many quotations are being made in all sections of the country, which leads the trade to believe that a definite upturn in sales will be apparent soon.

Railroads are conspicuous as prospective buyers. The Delaware, Lackawanna & Western has asked for prices on 15 items of shop equipment, the New York Central is inquiring for several tools, while dealers in Chicago have recently submitted bids on a good deal of railroad business, with the possibility that more will come into the market in the early future. The Chicago & North Western has ordered an 800-ton wheel press.

As a general rule, inquiries from industrial plants are confined to one or two tools, but, with such inquiries more numerous, the total of pending business is fairly large.

Production at machine tool plants is continuing at a high rate. Shipments are, of course, heavier than new business, with the result that nearly all companies are rapidly reducing their list of unfilled orders, and deliveries are shortening.

New York

NEW YORK, Feb. 10.—One local machine tool dealer reports that the past week was the best in volume of sales since last November, but this experience appears to be somewhat exceptional, as most of the sales offices report little or no gain in orders, though inquiries are increasing in number. The fact that so many companies are seeking prices on tools leads to the belief in the trade that an upswing in buying may develop soon. The General Electric Co. has issued inquiries for a few tools. The New York Central has inquired for two 6-ft. radial drills and a few other tools. The largest inquiry of the week comes from the Delaware, Lackawanna & Western, which asks for prices on 15 items of shop equipment as follows:

One 15-in. ball-bearing sensitive drilling machine.
One hollow hexagon turret lathe, 3-in. capacity.
One 6-ft. radial drilling machine.
One 12-in. x 6-ft. tool-room lathe.
One universal turret lathe.
One 18-in. x 6-ft. universal turret lathe.
One 14-in. x 6-ft. geared-head engine lathe.
One 12 x 5-ft. high-speed lathe.
One ½-in. to 2-in. pipe threading and cutting-off machine.
One double floor grinder.
One pneumatic jolting and roll-over molding machine.
One 14-in. x 8-ft. geared-head, screw-cutting engine lathe.
One combination punch and shear, 15-in. throats.
One arbor press.
One tool grinding machine.

American Cyanamid Co., 535 Fifth Avenue, New York, has acquired plants and properties of Superior Bauxite Co., Bauxite, Ark., and Superior Chemical Co., Joliet, Ill., manufacturer of sodium aluminum sulphate and kindred products, and will operate under direction of Kalbfleisch Corporation, 200 Fifth Avenue, New York, a subsidiary. Purchasing company is contemplating extensions and improvements at Joliet to cost over $300,000 with equipment. Harry L. Derby, president of Kalbfleisch Corporation, will be head of acquired interests.

Koch & Wagner, 32 Court Street, Brooklyn, architects, has awarded a general contract to William E. Anderson, Inc., 885 Flatbush Avenue, for a one-story machine and repair shop and garage, 200 x 216 ft., at Maspeth, L. I., to cost about $200,000 with equipment.

Chilton Pen Co., 287 Columbus Avenue, Boston, has removed its plant to new factory at 110 Third Street, Long Island City, and will increase output.

New York Power & Light Corporation, 126 State Street, Albany, N. Y., a subsidiary of Niagara-Hudson Power Corporation, is arranging for expansion improvements, to cost $9,600,000, including transmission lines.

Parkway Motors Co., White Plains, N. Y., has work under way on a two-story service, repair and sales building, to cost about $100,000 with equipment. P. B. Nichols, Depot Plaza, is architect.

Horace Ginsberg, 205 East Forty-second Street, New York, architect, has filed plans for a five-story automobile service, repair and garage building, 75 x 100 ft., to cost about $150,000 with equipment.

New York Brass Bed & Bedding Mfg. & Refinishing Co., 528 Grand Street, New York, has leased space in building at 336 Delancey Street and part of building at 62-64 Mangin Street, adjoining, for expansion.

National Lead Co., 111 Broadway, New York, has awarded general contract to Cedric-Burgher Co., Dallas, Tex., for one-story factory branch and distributing branch at Dallas, 75 x 130 ft., to cost about $70,000 with equipment. Southwestern headquarters of company are in International Life Building, St. Louis.

General Cable Corporation, 420 Lexington Avenue, New York, has made application to City Commission, Perth Amboy, N. J., for vacating part of DeKalb Avenue, adjoining local plant of Standard Underground Cable Co., for addition to rubber-covered wire manufacturing unit, to cost over $100,000 with equipment. Company is developing local works to be largest plant in East.

Jersey Central Power & Light Co., 20 South Street, Asbury Park, N. J., will issue $550,000 in preferred stock, and 55,000 shares of common stock, no par value, part of proceeds to be used for expansion and improvements, including completion of new steam-operated electric generating plant at South Amboy, N. J., and construction of high-tension transmission lines from station site to Freneau and vicinity. Entire expansion program of company will cost about $10,000,000.

Arcturus Radio Co., 260 Sherman Avenue, Newark, manufacturer of radio tubes and equipment, will concentrate production of six plants at three plants in this vicinity, including location noted, at 720 Frelinghuysen Avenue, Newark, and at Harrison, N. J. Expansion will be carried out to practically double former capacity of all plants. George Lewis is executive vice-president.

Moeller Instrument Co., 261 Sumpter Street, Brooklyn, has been organized to take over business of A. E. Moeller Co. Active ownership and management of company remains the same.

New England

BOSTON, Feb. 10.—Dealers report a slight improvement in machine tool sales. Prospective buyers seem more interested in filling their requirements and it is believed that business in February will be better than expected. Current inquiries are mostly for single machines. Small tool sales continue in good volume.

Billings & Spencer Co., Hartford, Mass., have opened a New York office at 53 Warren Street, New York. W. Roy Moore is manager.

Edward J. Lamothe Co., Somerville, Mass., is taking bids on a one-story plant, 97 x 137 ft. Motors and miscellaneous equipment will be needed.

Superior Spring & Mfg. Co., Hartford, has revised plans for a one and two-story manufacturing and storage plant, for

which conveying and mechanical equipment will be wanted.

Grafton County Electric Light & Power Co., 89 Broad Street, Boston, has plans for new hydroelectric power plant at McIndoes, Vt., to cost over $400,000 with transmission system.

Atlantic Works, 80 Border Street, Boston, is planning to rebuild four-story forge and blacksmith shop recently destroyed by fire.

S. K. F. Industries, Inc., New Park Avenue, Hartford, Conn., manufacturer of ball and roller bearings, has awarded general contract to Chicago Industrial Construction Co., 53 West Jackson Boulevard, for one-story factory branch and distributing plant at Chicago, to cost about $40,000 with equipment.

Plantsville Foundry Co., Plantsville, Conn., recently organized with capital of $50,000, has taken over plant formerly occupied by Walker-Stewart Foundry Corporation, and will occupy for production of gray iron castings.

Brown Co., 404 Commercial Street, Portland, Me., manufacturer of paper and fiber products, has authorized expansion and improvements at Berlin, N. H., mills, including installation of evaporating plant, etc., to cost more than $350,000 with equipment.

Green Mountain Power Co., Burlington, Vt., is disposing of a bond issue of $1,015,000, part of proceeds to be used for expansion and improvements.

Wilhelm Stellman, Brattleboro, Vt., is planning to rebuild part of machine shop destroyed by fire Jan. 31.

Incorporation papers of Whitney Sales Corporation, Hartford, Conn., have been filed. Officers are: C. E. Whitney, president; C. A. Pease, treasurer, and C. E. Wertman, secretary. All are officers of the Whitney Mfg. Co., also of Hartford.

Atwater Mfg. Co., Southington, Conn., has been acquired by Tubular Products Co., of same city, through purchase of majority of capital stock in former company from its president-treasurer and vice-president, Alfred M. Smith and Bradley H. Barnes. Company will continue manufacture of drop forgings and contemplates expansion.

St. Louis

ST. LOUIS, Feb. 10.—Firestone Tire & Rubber Co., Akron, Ohio, will take bids at once for two-story factory branch and distributing plant at Kansas City, Mo., to cost about $100,000 with equipment. C. A. Smith, Finance Building, Kansas City, is architect.

Department of Water, Light & Power, City Hall, Kansas City, Kan., is considering extensions and improvements in municipal electric light and power plant, including installation of 10,000-kw. turbogenerator unit, boilers and auxiliary equipment, to cost more than $1,000,000. Burns & McDonnell Engineering Co., Interstate Building, Kansas City, Mo., is consulting engineer.

Mexico Refractories Co., Mexico, Mo., J. B. Arthur, president, is contemplating local plant, to cost over $65,000 with equipment.

Union Electric Light & Power Co., Twelfth and Locust Streets, St. Louis, has begun work on one-story equipment storage and distributing plant, 160 x 300 ft., with automobile service and repair unit, garage, etc., to cost more than $100,000 with equipment. LaBeaume & Klein, American Trust Building, are architects.

R. L. Dedman, Blytheville, Ark., radio engineer, is at head of a project to establish a local plant for manufacture of radio testing instruments and other radio equipment, to cost about $30,000 with equipment.

It was erroneously reported in Dec. 26 issue of THE IRON AGE that removal of its sales office and service station from 6400 Plymouth Avenue to 1935 Indiana Avenue is announced by Wagner Electric Corporation, St. Louis. In point of fact, home address of corporation, 6400 Plymouth Avenue, St. Louis, remains unchanged. Chicago sales office has been moved to 1935 Indiana Avenue, Chicago.

Cleveland

CLEVELAND, Feb. 10.—Machine tool orders and inquiry increased slightly the past week. Several sales represented the closing of business that had been pending since late last year. A local manufacturer bought four lathes. Other orders were mostly for single machines. Inquiry is of a single tool character. Most metal-working plants are still operating at reduced capacity and many prospective buyers say that they will not purchase additional equipment, aside from tools that are required for immediate use, until their business picks up.

American Can Co., 1654 East Fortieth Street, Cleveland, with headquarters at New York, is considering an expansion and improvement program at local plant, to cost over $1,000,000 with equipment.

India Tire & Rubber Co., Akron, Ohio, is arranging for $1,300,000 increase in capital stock, part of proceeds to be used for expansion and improvements.

Cleveland Electric Illuminating Co., Illuminating Building, Cleveland, has awarded general contract to Hunkin-Conkey Construction Co., Newman-Stern Building, for superstructure for new steam-operated electric generating plant at Ashtabula, Ohio, to cost more than $3,000,000.

Board of County Commissioners, Court House, Cleveland, is considering automobile service, repair and garage building for County cars, to cost about $100,000 with equipment. F. R. Williams, County engineer, is in charge.

Falls Rubber Co., Cuyahoga, Ohio, has arranged for merger with Cooper Tire & Rubber Co., Findlay, Ohio, consolidation to have a net working capital of $1,500,000. Present plants will be continued developing a capacity of about 4000 tires and 8000 tubes per day.

Palmer Match Co., Akron, Ohio, has revised plans for extensions in two-story machine building, to cost more than $100,000 with equipment. Hannah & Sterling, 209 Ninth Street, Pittsburgh, are architects and engineers.

East Ohio Gas Co., 1405 East Sixth Street, Cleveland, has plans for a one-story mechanical and repair shop at Dennison, Ohio, to cost about $30,000 with equipment. C. J. Marr, 151 Broadway, New Philadelphia, Ohio, is architect.

Ohio Bell Telephone Co., 42 East Gay Street, Columbus, Ohio, has revised plans for a one and two-story storage and distributing plant at Toledo, Ohio, to cost about $140,000 with equipment. Service and garage unit for company trucks and cars will be included. Mills, Rhines, Bellman & Nordhoff, Ohio Building, Toledo, are architects.

Recent lifting magnet sales by the Ohio Electric & Controller Co., Cleveland, Ohio, have included three 55-in. and two 65-in. magnets to the Great Lakes Steel Corporation and four 36-in. magnets to the Chile Exploration Co., for use on booms of steamers which will collect scrap along the coast of Chile. Other sales were four 65-in. magnets to the General Steel Castings Co., Eddystone, Pa., one 55-in. magnet to the Southern Malleable Iron Co., East St. Louis, Ill., one 55-in. magnet to the Carnegie Steel Co., Clairton, Pa., and a 36-in. magnet to the Universal Exploration Co., Jefferson City, Tenn.

Philadelphia

PHILADELPHIA, Feb. 10. — Philadelphia Electric Co., Tenth and Chestnut Streets, Philadelphia, has purchased block bounded by Thirty-second, Thirty-third, Thompson, Master Streets, and Pennsylvania Avenue, as site for new equipment storage and distributing plant, with meter departments, mechanical and repair divisions, to cost more than $800,000 with equipment.

Linear Packing & Rubber Co., Marshall and West Berks Streets, Philadelphia, has awarded a general contract to Wintz Brothers, Inc., 1618 Sellers Street, for two-story addition, to cost about $40,000 with equipment.

Sun Oil Co., 1608 Walnut Street, Philadelphia, has arranged for a preferred stock issue of $5,000,000, most of proceeds to be used for extensions and improvements in oil refineries, storage and distributing plants.

F. C. Vogt & Sons, Inc., Thirtieth and Race Streets, Philadelphia, meat packer, has asked bids on general contract for new four-story and basement plant, 112 x 250 ft., with one-story addition, 90 x 120 ft., for repair and garage building, to cost close to $1,000,000 with equipment. Bids previously received have been rejected. C. B. Comstock, 110 West Fortieth Street, New York, is architect and engineer.

Packard, Inc., 3223 North Broad Street, Philadelphia, representative for Packard automobile, has plans for three-story service, repair and sales building, to cost about $275,000 with equipment. Philip S. Tyre, 114 South Fifteenth Street, is architect.

Dravo Contracting Co., Neville Island, Pittsburgh, will carry out an expansion and improvements at ship and barge building and repair plant at Wilmington, Del., to cost over $80,000 with equipment.

International Harvester Co., 606 South Michigan Avenue, Chicago, has plans for a one-story factory branch and distributing plant at Scranton, Pa., to cost about $50,000 with equipment. W. M. Whitney, 429 Quincy Avenue, Scranton, is architect.

Purchasing Department, Day & Zimmerman Engineering & Construction Co., 112 North Broad Street, Philadelphia, is asking bids until Feb. 27 for steel sash for new Eastern State Penitentiary at Graterford, Pa.

Board of Trustees, Lafayette College, Easton, Pa., has plans for a one-story power plant, to cost about $100,000 with machinery. L. T. Klauder, Bankers' Trust Building, Philadelphia, is architect.

Rohm & Haas Co., 222 West Washington Street, Philadelphia, manufacturer of chemical products, has asked bids on general contract for a three-story and

basement plant at Bristol, Pa., to cost over $75,000 with equipment. William W. Potter, Real Estate Trust Building, Philadelphia, is architect.

Yale & Towne Mfg. Co., Stamford, Conn., has completed a building at 4530 Tacony Avenue, Philadelphia, which will house manufacturing units of its Stuebing hand-lift truck division. Sales and service of the Stuebing trucks and Yale electric industrial trucks for eastern Pennsylvania, southern New Jersey, Delaware and Maryland will be handled from Philadelphia address.

Pittsburgh

PITTSBURGH, Feb. 10.—Local dealers are deriving some satisfaction from the policies of most of the large companies in going ahead with improvement programs announced the latter part of last year, and prospects over a long period are good. However, buying at present is still restricted and few lists of any consequence are before the trade. The Westinghouse Electric & Mfg. Co. is buying more freely against its first quarter list. Railroad business is negligible, but scattered inquiry is coming from this source and reports of large lists in the spring are encouraging.

Announcement by Weirton Steel Co. that it will begin immediate construction of a $6,000,000 rail and shape mill is of considerable interest to makers of heavy machinery and steel mill equipment, who are already well occupied with work of this kind.

Joseph Woodwell Co., 5984 Center Avenue, Pittsburgh, operating a wheel and rim, and automobile accessory plant, has leased property at 4909 Liberty Avenue, 65 x 120 ft., and will remodel for new plant.

Union Wire Die Corporation, 333 West Fifty-second Street, New York, has leased space in Century Building, Pittsburgh, for new branch plant, to cost about $60,000.

Troy Engine & Machine Co., Troy, Pa., has plans for extensions and improvements in three-story plant, to cost over $50,000 with equipment. W. E. S. Dyer, Land Title Building, Philadelphia, is architect and engineer.

Witherow Die Rolling Corporation, Neville Island, Pittsburgh, recently organized by Lawrence D. Blair, 5618 Northumberland Street, and associates, contemplates operation of local plant in Neville Island district for manufacture of iron and steel products. James M. Bovard, University Club, is treasurer.

West Virginia Stove Foundry Co., Huntington, W. Va., has acquired plant and property of Treasure Stove Works, Inc., Gallipolis, Ohio, and will consolidate. Gallipolis plant will be removed to Huntington, where production will be concentrated.

United Pocahontas Coal Co., Crumpler, W. Va., has awarded contract to Link Belt Co., 300 West Pershing Road, Chicago, for new all-steel coal tipple, to cost over $100,000 with equipment.

Detroit

DETROIT, Feb. 10.—Federal Steel Corporation, 126 South Artillery Street, Detroit, has begun an expansion program, to include addition of new pickling department with vats, overhead cranes and other equipment, to cost about $100,000.

W. F. Stewart Co., Flint, is planning to rebuild three-story automobile body manufacturing plant recently destroyed by fire.

Lew S. Wallace, Grand Rapids, formerly head of Berkey & Gay Furniture Co., and associates are planning establishment of a new furniture factory, to cost more than $200,000 with equipment. W. J. Wallace, heretofore vice-president, secretary and treasurer of Berkey & Gay Company, will be associated with new enterprise, which is expected to be known as Wallace Furniture Co.

Northern Aircraft Co., Lansing, recently organized by Fred A. Lankton, Lansing, and associates, is planning early operation of local plant to build light type commercial airplanes, including parts and assembling departments. Mr. Lankton will be president and general manager.

Borin Brothers, Inc., 1635 Westminster Avenue, Detroit, has plans for a one-story ice-manufacturing plant at Royal Oak, to cost $80,000 with machinery, which will be electrically operated. Westerlin & Campbell, 1113 Cornelia Avenue, Chicago, are architects and engineers.

Detroit City Gas Co., 415 Clifford Street, Detroit, is arranging an expansion and improvement program to cost over $2,000,000, including extensions in artificial gas plants and distributing facilities.

Stinson Aircraft Corporation, Wayne, Detroit, a subsidiary of Cord Corporation, Auburn, Ind., is arranging for expansion to triple present production. William A. Mara is vice-president.

Chicago

CHICAGO, Feb. 10.—The local machine tool market is steady. Fresh inquiry from railroads is confined to a request for prices from the Chicago & North Western for an 800-ton wheel press. Recent lists from the railroads have been large and dealers have been busy submitting bids, which now are being tabulated by the carriers. Definite inquiry from roads west of Chicago has not been made, but it is understood lists are in preparation and bids will be asked in the early spring.

Inquiries from industrial plants are confined for the most part to single tools or small lots and cover a wide territory. Deliveries of machine tools are generally satisfactory, with a general tendency for further improvement.

Peoria Malleable Castings Co., Alexander Street, Peoria, Ill., has plans for a three-story addition, to cost about $40,000 with equipment. L. E. Robinson, Inc., Jefferson Building, is architect and engineer.

Continental Scale Mfg. Co., 5701 South Claremont Avenue, Chicago, has plans for a three-story factory to cost about $120,000 with equipment. E. G. McClellan, 7441 Cottage Grove Avenue, is architect.

Standard Oil Co. of Indiana, 910 South Michigan Avenue, Chicago, has authorized increase in capital from $450,000,000 to $500,000,000, part of proceeds to be used for expansion and for acquisition and development of other properties.

Gordon Coal Co., Gordon, near Walsenburg, Colo., has plans for rebuilding tipple and other structures recently damaged by fire, including surface machinery.

William Brothers Boiler & Mfg. Co., Nicollet Island, Minneapolis, Minn., manufacturer of boilers, tanks, steel automobile bodies, etc., is contemplating an addition to cost about $100,000 with equipment. Raymond J. Bros is secretary.

City Council, Ottumwa, Iowa, has plans for municipal hydroelectric generating plant on Des Moines River, to cost over $700,000 with transmission lines. H. E. Cook, City Hall, is city engineer. Brown Engineering Co., 106 North Market Street, is designing and consulting engineer.

United Autographic Register Co., 2316 West Forty-third Street, Chicago, has taken bids on general contract for one and two-story plant to cost over $750,000 with equipment. Frank D. Chase, Inc., 720 North Michigan Boulevard, is architect and engineer.

Belleville Stove & Range Co., Third Street and Cleveland Avenue, Belleville, Ill., plans rebuilding part of plant recently destroyed by fire.

Cincinnati

CINCINNATI, Feb. 11.—Demand for lathes increased slightly the past week. Sales of other types of machines, however, are slow, although inquiry for all classes of tools is quite brisk. Machine tool production is being maintained at a high rate, but unfilled orders are being reduced. District manufacturers, however, are optimistic regarding prospects for the near future.

Lodder Boat Co., 3711 Beechmont Avenue, Cincinnati, is considering new one-story boat-building and repair plant, to cost over $40,000 with equipment. Paul Hanselman is one of heads of company, in charge.

Brownell Co., North Findlay Street, Dayton, Ohio, manufacturer of boilers, tanks, stokers, etc., has awarded general contract to I. F. Weber Co., Dayton, for two-story addition, 35 x 105 ft., to cost about $100,000 with equipment. Geyer & Neuffer, Ludlow Arcade, are architects.

Henry Vogt Machine Co., Tenth Street, Louisville, manufacturer of ice-making and refrigerating machinery, has plans for a one-story addition, to cost over $75,000 with equipment.

Southern Railway System, Fourth and Sycamore Streets, Cincinnati, will soon begin erection of new locomotive and car repair shops at Ludlow, Ky., to cost over $110,000 with equipment. Engineering department of railroad is in charge.

Buckeye Foundry Co., 2257 Buck Street, Cincinnati, William Gilbert, Jr., president, has purchased about 3½ acres on Beekman Street, and is contemplating erection of new plant to cost about $400,000 with equipment.

Indiana

INDIANAPOLIS, Feb. 10.—Beatty Machine & Mfg. Co., 150th Street, Hammand, manufacturer of punching and shearing machinery, parts, etc., has asked bids on general contract for a two-story and basement addition, 45 x 50 ft., to cost about $40,000 with equipment. Hjalmar Nilsson, 310 Sheffield Avenue, is architect.

Cleveland, Cincinnati, Chicago & St. Louis Railroad Co., Big Four Building, Cincinnati, is contemplating an addition to engine house and repair shops at Duane, Ind., to cost about $100,000 with

equipment. H. A. Aldrich, address noted, is company architect.

Paramount Oil Co., Continental Bank Building, Indianapolis, has filed plans for oil storage and distributing plant, to cost about $40,000 with equipment. E. C. Gheen is manager.

Radio Allied Industries, Inc., 1148 Division Street, Indianapolis, a subsidiary of United States Radio & Television Co., Chicago, has acquired local plant and business of Furnas Furniture Co., 139 South East Street, specializing in production of radio cabinets, and will consolidate. Both plants will be continued in operation and developed to capacity of 4000 radio cabinets daily.

Pearce Veneers, Inc., 324 West Fourteenth Street, Indianapolis, is planning to rebuild part of plant destroyed by fire Feb. 1.

South Atlantic

BALTIMORE, Feb. 10.—Consolidated Gas, Electric Light & Power Co., Lexington Building, Baltimore, is arranging for a common stock issue to total $6,267,620, considerable part of fund to be used for expansion and improvements, including transmission lines and other work.

C. F. Meislahn & Co., 219 North Sharp Street, Baltimore, manufacturer of furniture, is considering a four-story addition, to cost about $45,000 with equipment.

Hopewell Ice & Coal Co., Hopewell, Va., has approved plans for an addition to ice-manufacturing plant, to cost about $35,000 with machinery.

City Council, Augusta, Ga., is considering construction of municipal hydro-electric power plant, to cost about $5,000,000 with transmission system. Burns & McDonnell Engineering Co., Interstate Building, Kansas City, Mo., is consulting engineer.

Grinnell Co., Inc., Providence, R. I., manufacturer of fire extinguishers, fire sprinkler systems, etc., is contemplating factory branch and distributing plant at Charlotte, N. C., to cost over $125,000 with equipment.

Statesville Veneer & Paint Co., Statesville, N. C., is considering rebuilding part of plant destroyed by fire Feb. 1.

Standard Oil Co. of New Jersey, 26 Broadway, New York, and St. Paul Place, Baltimore, has asked bids on general contract for a new storage and distributing plant at Columbia, S. C., to cost over $275,000 with equipment. Company engineering department, Baltimore, is in charge.

Rustless Iron Corporation of America, Inc., Loney's Lane and Pennsylvania Railroad, Baltimore, has taken options on 500 acres at Huron, Ohio, and is considering new plant to cost over $400,000 with equipment.

Board of Aldermen, Kinston, N. C., is asking bids until Feb. 21 for equipment for municipal electric power plant, including one 3500-kw. turbo-generator unit with direct-connected exciter, turbo-generator air cooler, and surface condenser complete with pumps, valves, etc., also switchboard, accessory equipment, and crane for turbine room. William C. Olsen, Inc., Raleigh, N. C., is engineer. J. E. Weyner is superintendent of water and light department.

North Carolina Granite Corporation, Mount Airy, N. C., has plans for a one-story gang saw shop, including finishing division, to cost over $50,000 with equipment.

Washington County School Board, Grand Building, Hagerstown, Md., is planning installation of manual training equipment in two new junior high schools, each to cost about $150,000, for which it is expected to ask bids on general contract early in March. C. E. Kuntz, Young Building, is architect for one unit, and A. J. Klinkhart, Kohler Building, architect for other.

The Crane Market

INQUIRY for locomotive cranes is beginning to increase with industrial users and contractors in the market. Some substantial business in overhead cranes is pending award, including six of small capacity for the new Everett, Mass., foundry of the Warren Foundry & Pipe Co., four gantry cranes for the Baltimore & Ohio Railroad and a 25-ton, 28-ft. span, double-trolley electric crane for the New England Power Association, Boston. A paper mill in Maine has just placed an order for six hand power and one electric crane.

Gulf States

BIRMINGHAM, Feb. 10.—South Plains Pipe Line Co., Lubbock, Tex., a subsidiary of Prairie Oil & Gas Co., Independence, Kan., is planning construction of new natural gas pipe line in west and northwest Texas, totaling about 500 miles. to cost more than $350,000 with booster stations and mechanical equipment.

City Council, Harbor Board, Houston, Tex., is planning addition to municipal grain elevator, including elevating, conveying, screening and other equipment, to cost $1,500,000 with machinery.

Washington Parish School Board, Franklinton, La., is planning installation of manual training equipment in new two-story high school to cost about $125,000, for which bids are being asked on general contract until March 3. Herman J. Duncan, 120 Murray Street, Alexandria, La., is architect.

Southwestern Gas & Electric Co., Shreveport, La., is planning extensions and improvements in steam-operated electric generating plants, transmission lines, power substations and distributing systems, to cost $2,800,000. Similar work will be carried out at ice-manufacturing plants to cost about $100,000.

Temple Lumber Co., Texarkana, Tex., is considering new mill near Clarksville, Tex., to cost over $100,000 with machinery; project will include power house and machine shop.

M. & V. Tank Co., Iowa Park Road, Wichita, Tex., manufacturer of steel tanks and other products, has arranged for increase in capital from $150,000 to $225,000 for expansion.

Board of Trustees, Alabama Polytechnic Institute, Auburn, has asked bids on general contract for new buildings at institution, including a one and two-story shop unit, 50 x 250 ft. Entire project will cost over $350,000. Warren, Knight & Davis, Protective Life Building, Birmingham, are architects.

General Public Utilities Co., operating Gulf Public Service Co., Jacksonville, Tex., and other electric light and power utilities, is disposing of a note issue of $4,000,000, part of proceeds to be used for expansion and improvements. Company is under management of Day & Zimmerman, Inc., 1600 Walnut Street, Philadelphia, engineer.

Southern Union Gas Co., American exchange Bank Building, Dallas, Tex., is planning construction of natural gas pipe line from Hereford to Farwell, Tex., to cost more than $80,000.

Milwaukee

MILWAUKEE, Feb. 10. — Pending machine tool transactions have increased, with slight improvement in actual sales. Three of the largest plants in Milwaukee manufacturing tractors, containers, automobile equipment and motors showed gains during January over those in the same period last year. Machine tool builders report an upward trend of business, with most orders for single machines and for immediate shipment. Foundries, small machine shops, tool and die manufacturers are beginning to enter the market and are operating for the most part on full schedules.

Oscar Kirsten, surviving partner of firm of Doelger & Kirsten, Milwaukee, manufacturers of alligator shears, has purchased for $129,400 interest of Mrs. Katherine A. Doelger, widow of Charles Doelger, in the firm.

White Rock Silica Co., Browntown, Wis., subsidiary of W. J. Newman Co., Chicago, has begun work on additions to cost about $150,000. Additional handling and loading facilities will be required. J. J. Gault is in charge of development.

Anton Dohman, 542 Cramer Street, Milwaukee, architect, has plans for a $50,000 machine shop, owner's name withheld for present.

E. Weiner Co., 297 Seventh Street, Milwaukee, has plans by Dick & Bauer, Inc., local architects, for addition of two stories to present six story factory, 50 x 50 ft.

Louis Hoffmann Co., 279 Pittsburgh Avenue, Milwaukee, manufacturer of sheet metal products, has incorporated under same name with capital stock of 2000 shares without par value. Louis Hoffmann and his sons are owners and active heads of business.

Buffalo

BUFFALO, Feb. 10.—Following recent purchase of William A. Rogers, Ltd., Niagara Falls, N. Y., manufacturer of cutlery, plated ware, etc., and affiliated organizations, by Oneida Community, Ltd., Oneida, N. Y., plant of S. L. & G. H. Rogers Co., Hartford, Conn., a unit of acquired organization, has been closed and equipment will be transferred to main plant at Oneida, where production of silverware and plated goods will be concentrated. It is proposed to continue main plant of acquired company at Niagara Falls.

Alpha Portland Cement Co., Easton, Pa., is contemplating new mill near Jamesville, N. Y., to cost over $500,000 with machinery.

Beebe Island Corporation, Watertown, N. Y., G. Seymour Knowlton, president, is considering construction of new hydro-electric generating plant near city, to cost over $1,000,000 with transmission lines.

Jeffrey-Fell Co., 320 Pearl Street, Buffalo, manufacturer of surgical instru-

ments and precision equipment, has arranged for an increase in capital from $200,000 to $400,000 for expansion.

Canada

TORONTO, Feb. 10.—Although machine tool sales the past week were confined largely to replacement needs, more interest is developing and inquiries coming out indicate a heavy buying movement in the early spring. While a large amount of the new business probably will be placed in the United States, it is believed that Canadian builders will also receive a good share of orders.

George Waite, president of Irving Air Chute Co., Buffalo, will start work immediately on erection of a plant at Bridgeburg, Ont., to take care of Canadian business of company.

Several contracts have been let for an addition to plant of B. Greening Wire Co., Ltd., Hamilton, Ont.

W. D. Beath & Son, Ltd., Regina, Sask., manufacturer of electric hoists, steel drums, etc., will start work in spring on erection of a manufacturing plant.

Utilities Commission, Essex, Ont., will purchase new turbine pump for waterworks plant. R. R. Brett is clerk.

Dominion Electric Protection Co., Clark and Evans Streets, will start work immediately on erection of a plant at Montreal.

George Rathbone Lumber Co., Gladstone Avenue and Queen Street, Toronto, will start work immediately on an addition to wood-working factory, to cost $20,000. Tools and other equipment will be purchased.

Foreign

IN connection with 1930 development program, Soviet Russian Government, Moscow, is planning construction of machinery and machine tool works at Gomel, to cost over $2,500,000 with equipment; also a boiler and plate works at Kramatorova, to cost more than $5,000,000 with machinery. Albert Kahn, Inc., Marquette Building, Detroit, architect and engineer, has been engaged as consulting architect for five-year industrialization program, covering new construction and improvements to cost about $1,900,000,000. Amtorg Trading Corporation, 261 Fifth Avenue, New York, is official buying agency of Soviet Union.

Siemens & Halske A. G., Berlin, Germany, manufacturer of electric machinery for power plants, and other heavy steel products, is disposing of a bond issue to total $32,500,000, considerable part of proceeds to be used for expansion.

Compagnie de Superphosphates et Produits Chimiques du Maroc, Casablanca, Morocco, is planning extensions in superphosphate manufacturing plant, to cost over $400,000 with machinery.

Municipal Government, Valparaiso, Chile, is considering industrial development program on 500-acre tract near city limits, including electric generating plant, wharf with mechanical-handling equipment and other work. Information at office of Bureau of Foreign and Domestic Commerce, Washington, reference Chile No. 325945.

Pacific Coast

SAN FRANCISCO, Feb. 6.—Rheem Mfg. Co., 4535 Horton Street, Oakland, Cal., manufacturer of steel drums, etc., has awarded general contract to H. J. Christensen, Ray Building, for new one-story plant at San Pablo, totaling about 25,000 sq. ft. floor space, to cost about $60,000 with equipment. Alben Froberg, Ray Building, is architect.

Courier Monoplane Co., 1255 West First Street, Long Beach, Cal., is considering new one-story plant at Pomona, Cal., including parts and assembling departments, to cost over $50,000 with equipment.

Harbor Union High School District, Newport Beach, Cal., plans construction of one-story vocational shop at proposed new high school group, to cost $400,000. Marsh, Smith & Powell, Architects' Building, Los Angeles, are architects.

Price-Pfister Brass Mfg. Co., 3011 Humboldt Street, Los Angeles, has awarded general contract to Pacific Iron & Steel Co., 241 West Avenue 26, for a one-story addition, 60 x 80 ft., to cost about $23,000 with equipment.

New England Sheet Metal Works, 301 Broadway, Fresno, Cal., has awarded general contract to W. T. Harris, 577 McKinley Street, for one-story sheet metal-working shop, 50 x 140 ft., to cost about $40,000 with equipment.

American Can Co., Ogden, Utah, has approved plans for a one-story factory, 80 x 210 ft., primarily for enameling, to cost more than $35,000 with equipment. Headquarters are at 230 Park Avenue, New York.

El Travia Co., Los Angeles, has awarded general contract to Sumner Sollitt Co., 810 West Sixth Street, for one-story hangar, 150 & 965 ft., with repair and reconditioning facilities, to cost about $30,000 with equipment.

Northern Pacific Railroad Co., St. Paul, Minn., contemplates new car and locomotive shops, with yard facilities, at Aberdeen, Wash., to cost over $75,000 with equipment. A site for plant at Hoquiam, Wash., is also under consideration.

Board of Education, Los Angeles, has plans for a one-story vocational shop at Fairfax High School, to cost about $50,000 with tools and equipment. John and Donald B. Parkinson, Title Insurance Building, are architects.

New Trade Publications

Commercial Products.—Vickers, Ltd., Vickers House, Broadway, London, S.W.1. Catalog of 49 pages showing a diversified list of products, including accumulators, pumps, aircraft lighting equipment, aluminum alloys, ingots, axles, crankshafts, boiler plates, brass and other non-ferrous metals, cranes and elevators, machinery, dies, cutting tools, forging presses, gears, hoists, armament items, locomotive parts, etc.

Modern Piping.—Linde Air Products Co., New York. Substantially bound, 77-page booklet describing the application of oxwelded pipe joints for gas distribution, power piping, piping for chemicals and other fluids used in manufacturing plants, for heating and refrigeration services. A general book, well illustrated, for owner, architect or manager.

Unit Control for Electric Welder.—Hobart Brothers, Troy, Ohio. Broadside showing 200 and 300 amp. constant arc welders with "Unitrol" dial, centralizing all control in one rheostat handle.

Metal Stampings.—Crosby Co., Buffalo. Catalog (32 pages, 8½ x 11 in.) showing typical forms stamped from plate or sheet metal for many industries. Many complex shapes are made of two or more parts, clinched, riveted or welded together.

Pumps.—Pennsylvania Pump & Compressor Co., Easton, Pa. Catalog No. 214 describes ball bearing type pumps, suitable for capacities up to 1800 gal. per min. against heads up to 300 ft. This line of pumps is an addition to company's regular line of single-stage, double-suction centrifugal pumps with spherically seated bearings.

Industrial Buildings.—Osborn Engineering Co., Cleveland. Catalog of 42 pages, illustrating various types of industrial buildings erected by the company, as well as football and baseball stadiums, grandstands, etc.

Ball Bearings.—Bearings Co. of America, Lancaster, Pa., manufacturer of ball bearings. A new load and data book covering company's complete line. Copies are available for engineers and purchasing agents.

Welding Cast Iron. — Westinghouse Electric & Mfg. Co., East Pittsburgh. Arc Welding data No. 11, pointing out some of the properties of cast iron and including a recommended procedure for the arc-welding of this material.

Wrapping Rolls.—Buffalo Forge Co., Buffalo, N. Y. Bulletin 327 of two pages illustrates and describes wrapping rolls for forming metal cylinders of diameters from 5 to 30 in. and depths from 2½ to 20 in. Among special uses are rings for small motor frames, wheel rims, steel pulleys, tractor and trailer wheels, etc.

Hoists and Derricks. — American Hoist & Derrick Co., St. Paul, Minn. Booklet of 20 pages, illustrating in color and describing various types and sizes of hoists and derricks, giving specifications in each case. Caterpillar types are featured, as well as floating equipment and locomotive cranes.

Total apparent consumption of babbitt metal in 1929 was 65,132,861 lb., compared with 59,676,765 lb. in 1928, according to reports received by the Department of Commerce from 31 firms. Total apparent consumption in December was 3,341,492 lb., the lowest figure since the reports began, in 1925. This compares with 4,522,034 lb., in November.

Negotiations for the purchase of 500 tractors to cost in excess of $2,000,000 have been opened between agents of the Soviet Government and Foote Brothers' Gear & Machine Co., Chicago. The machinery is to constitute part of a large purchase for use in an extensive highway improvement and construction program in Russia.

Makes Appeal for Prompt Census Returns

WASHINGTON, Feb. 11.—Col. L. S. Horner, president, Niles-Bement-Pond Co., as chairman of the advisory committee on the Census of Manufactures, has addressed a letter to "fellow manufacturers" asking for their cooperation with the Bureau of Census in connection with the 1930 decennial census now getting under way. Manufacturers are requested to fill out questionnaires accurately and return them at once to the bureau, assurance being given that individual returns will be treated confidentially. It was pointed out that to be of practical value information must be timely, and it was claimed that slow publication of census reports has been caused by delay on the part of manufacturers in filling out and returning questionnaires. Colonel Horner said that the Bureau of the Census is able to publish preliminary reports for an industry within three weeks from the time it receives complete and accurate reports from manufacturers involved.

Demand for Rustless Steel Gains

Important increases in the demand for steel alloys, notably chrome nickel alloy and stainless chrome steel, are reported by Harry E. Sheldon, president of the Allegheny Steel Corporation. The company's alloy mills at Brackenridge, Pa., are now working at full capacity, and production has doubled since last August, Mr. Sheldon stated.

"December production of steel alloys showed an increase of 17.8 per cent over the previous high tonnage record, and January production was 30.5 per cent above December," Mr. Sheldon said. "Orders for February shipment are substantially above the January figures."

Much of the increase is due to the Ford Motor Co., which recently adopted chrome nickel alloy as standard for the exterior polished parts on the new Ford car, Mr. Sheldon indicated. Ford requirements now represent about 30 per cent of the industry's total output, Mr. Sheldon said, but there is also much heavier demand from hotel, kitchen and dairy equipment manufacturers, and from the oil industry, which is now using chrome nickel alloy for condenser and still tubings.

Inland Steel Co. has purchased from Elk Horn Coal Corporation the latter's Wheelwright mine with its plant and equipment in the eastern Kentucky coal district, and has leased from the Elk Horn company about 11,000 acres of coal land. The Inland company will make substantial improvements in the plant and equipment to bring production up to approximately 1,000,000 tons a year, which will give Inland an adequate which will give the Inland company an adequate reserve of high-grade by-product coal.

The Week's News Quickly Told

Current Events That Bear on the Course of Business

SHOES and steel are the bright spots on the industrial horizon. Wholesale and retail merchandizing are both slow; the results of clearance sales being generally unsatisfactory. Interstate Merchants Association, meeting at Chicago, looks for good business this spring.

* * * * *

UNEMPLOYMENT features in the news from Chicago and Pittsburgh. Part time work rules in Detroit factories . . . Thirty thousand dressmakers strike in New York against unsanitary working conditions imposed by small contractors.

* * * * *

ADVISORY committee on sales is appointed by cotton cooperatives and by wheat growers, at the suggestion of the Federal Farm Board, as a step toward organization of stabilization corporations . . . Both cotton and wheat have declined severely; wheat is now 30 per cent cheaper than last summer. What little foreign purchasing has appeared is gravitating to the cheaper Canadian market . . . Canadian wheat growers' pools hold large quantities of unsold grain; three provincial governments have guaranteed banks a 15 per cent margin on their holdings.

* * * * *

COMMODITY prices remain at lowest index of 8 years . . . An attempted corner in rye failed and the price dropped to 83c., as compared to $1.10 last year.

* * * * *

MONEY is cheaper. Rediscount bank rates were reduced ½ per cent here and in the principal European countries . . . National Business Survey Conference reports a slight increase in the money available for mortgage loans on residential construction and renovating. Rates are from 5½ to 7 per cent, 60 per cent of the value is usually loaned . . . Total of all loans by banks reporting to the Federal Reserve is now 4½ per cent less than just before the stock market break . . . The German National Bank is reorganized; dividends to private stockholders are limited to 12 per cent, more profits are diverted into the national treasury, and financing of exports will be more generous.

* * * * *

CHAIN stores cut out waste, said Merritt Lum of Montgomery Ward. He believes that $8,000,000,000 of the $40,000,000,000 spent yearly with retailers is wasted on unnecessary effort . . . Hahn Department Stores report that stock cleaning and merchandising control has reduced the combined inventories of 28 department stores $6,000,000 without reducing the sales volume . . . Seventy per cent of the female employees in chain stores earn less than $15 a week, according to the U. S. Department of Labor.

* * * * *

COMPETITION from talkies is blamed for a $1,000,000 net loss during the last half of 1929 by Shubert Theater Corporation . . . Coca-Cola Co. sold for $39,000,000 syrups which cost $15,000,000 to make and transport. Sales expenses were $8,000,000 . . . Amoskeag Mfg. Co., world's largest manufacturer of cotton cloth, with newly modernized mills, resumes dividends passed since 1924 and also pays a 5 per cent bonus to employees; despite operations at only 55 per cent capacity.

* * * * *

AUTOMOBILE output in 1930 will total at least 4,500,000 cars and trucks, J. N. Willys tells President Hoover . . . Registration statistics show that about half the cars produced in 1929 replaced those definitely scrapped . . . General Motors Corporation earned $250,000,000 net in 1929, about 10 per cent less than 1928, although the number of cars sold increased slightly . . . Detroit ordinance approves projects to electrify the Grand Trunk railroad and to construct an elevated motor speedway above tracks, 26 miles long, connecting the new Ambassador bridge with Pontiac, Mich. . . . Fatalities in 78 large cities due to automobile accidents increased 11 per cent from 1928 to 1929 to the annual rate of 25.7 per 100,000 population.

* * * * *

RAILROAD consolidation, proposed for New England by Interstate Commerce Commission, will effect no operating economies nor improvements in traffic or service. P. B. Todd, president, Bangor & Aroostook Railroad, tells Governors' committee . . . Van Sweringen interests (Erie railroad) buy a $22,000,000 anthracite mining and distribution company, as well as a trucking company having extensive contracts for delivery of freight in New York region from competing roads . . . Gulf & West Texas Co. is authorized to build 113 miles of new track to link up short lines running from San Antonio into the Texas panhandle.

* * * * *

NAVAL conference progresses slowly. England and America have reached definite agreement on parity, not only as to total tonnage, but also as to all classes of warships of comparative weight and armament.

* * * * *

MERCANTILE insolvencies in January were the highest on record, 2759 commercial defaults with liabilities of $61,185,171, 8.8 per cent more in number and 13.6 per cent in liabilities than in January, 1929.

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THE IRON AGE

ESTABLISHED 1855

Member of
Audit Bureau of Circulations and of
Associated Business Papers, Inc.

Published Every Thursday by the
IRON AGE PUBLISHING CO.
239 West Thirty-ninth Street, New York

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Owned by the United Publishers Corporation, 239 West 39th Street, New York. A. C. Pearson, *Chairman*. F. J. Frank, *Pres.* C. A. Musselman, *Vice-Pres.* F. C. Stevens, *Secy. and Treas.*

BRANCH OFFICES—Chicago: Otis Building. Pittsburgh: 811 Park Building. Boston: Room 230, 80 Federal St. Philadelphia: 1402 Widener Building. Cleveland: 1362 Hanna Building. Detroit: 7338 Woodward Avenue. Cincinnati: 409 Traction Building. Buffalo: 616 Ellicott Square. Washington: 536 Investment Building. San Francisco: 703 Market Street.

Subscription Price: United States and Possessions, Mexico, Cuba, $6.00; Canada, $8.50; Foreign, $12.00 per year. Single Copy 25 cents.

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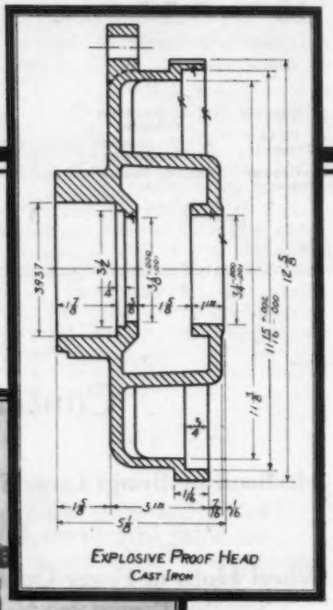
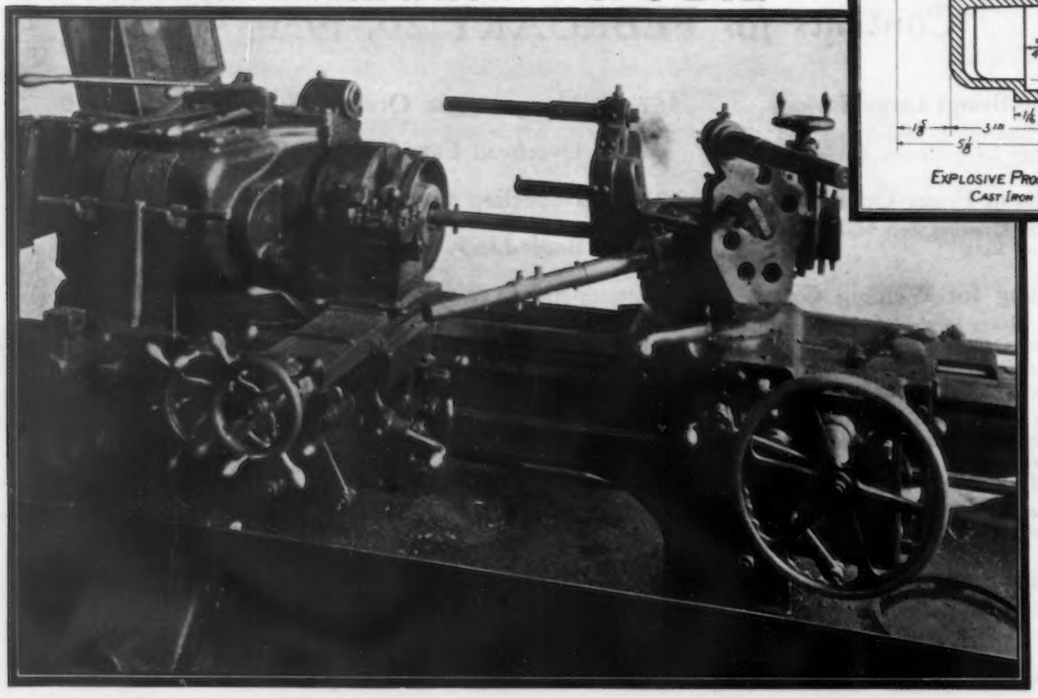
It Pays to Replace Obsolete Turret Lathes with Modern W & S Machines

A prominent manufacturer of electric motors replaced two old type turret lathes with a new W & S 2-A.





This modern Warner & Swasey machine made an average saving of 68% on several jobs previously done on the obsolete turret lathes.

The photograph illustrates the set-up for one job -- an Explosive Proof Head -- on which the machining cost was reduced from 30c to 17c.

This is the second of a series showing typical jobs in this customer's shop. The first appeared in the January 23rd issue of this magazine.

The Warner & Swasey Company

Cleveland, Ohio, U. S. A.